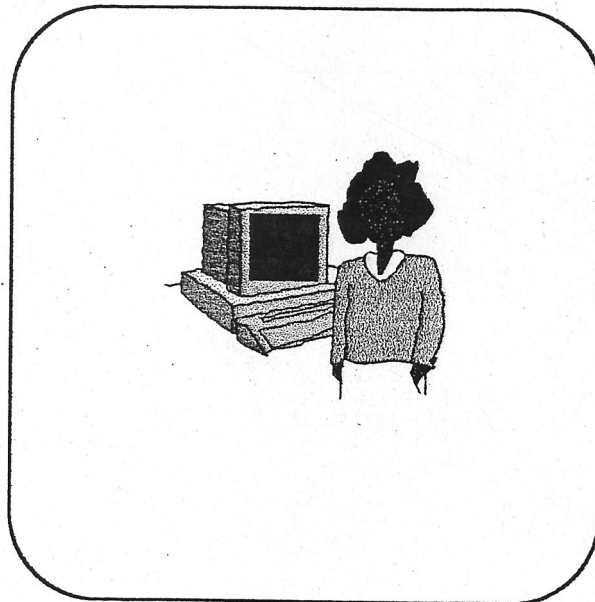


***Evaluating the effectiveness of the Touch-Type  
Read and Spell Computer Aided learning program  
on two groups of dyslexic children***



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## Conclusion

In this experiment set out to evaluate the Touch-type Read and spell computer aided learning program by Philip Alexandre. This was done by gaining a reading and spelling age of 12 dyslexic children aged between 8 & 12 before they started to use the program and again after they had been using it for about 4 months. The participants also evaluated the program by answering a questionnaire which assessed their attitudes towards the program and how effective they felt it was at improving their reading, spelling, confidence and motivation. It was found that exposing the children to the TTRS program for a period of 4 months improved their reading and spelling ages significantly, this improvement was significantly larger than the rate of improvement one would expect for a dyslexic child simply due to maturation. The TTRS program received an overall positive evaluation from the children involved in the study. It was great to find significant results however with such a small sample one must be careful in drawing too many conclusions.

These results highlight the importance of such specialised remediation programs for children with dyslexia, not only has the TTRS program appeared to significantly improve reading and spelling skills but it appears to have increased the children's level of self-confidence and motivation. Many dyslexic children can experience great frustration due to their disability this can lead to a lack of confidence and motivation, which may eventually result in the child ceasing to try in school. Surely if such a program as the TTRS can provide help for children with learning disabilities, schools should make every effort to make them available.

## ACKNOWLEDGEMENTS

My special thanks go to DR Ann-Marie Adams for her supervision, advise and support throughout the past year. She was always encouraging and positive, even when I had doubts about the course the experiment was taking.

I also wish to thank Jane Newman who runs the Saturday club at the Rescue Foundation in Llangranog, for introducing me to the Touch-type Read and Spell computer course, and encouraging me to evaluate it for my dissertation. I would also like to thank Jane for giving me access to the children at the Saturday club to use as participants in my study

Many thanks also to the children at the Saturday club for taking part in my study and to their parents for giving their consent and being supportive.

Finally I would like to thank the staff and pupils at Southmead Primary School who were involved with the study. The staff and pupils at Southmead were very helpful and accommodating and I am grateful for this.

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## ABSTRACT

The Touch-type Read and Spell (TTRS) multi-sensory computer aided learning program is specially designed for children and adults with reading and writing difficulties, with its aim being to develop literacy skills whilst at the same time raising levels of self-confidence and motivation. The TTRS program is based on the book 'Alpha to Omega' by Beve Hornsby which is based on the Orton-Gillingham approach of teaching phonetics.

The present study investigated the effects of TTRS multi-sensory computer program, on dyslexic children aged between 9 and 12 years (N=13) reading and spelling ages, and explored the participants opinions of the effectiveness of the TTRS program. Reading and Spelling ages were assessed using the Schonell graded word reading and spelling tests and the participants opinions of the TTRS program were assessed by administering a self-report questionnaire designed to evaluate different features of the TTRS program, such as self-confidence.

The study was a quasi experiment, using a pretest-posttest design. The experiment used a mixed 2 x 3 Factorial Design to analyse the effects of 2 independent variables; the introduction of the TTRS program and group (participants either used the TTRS program voluntarily at a Saturday club, or as part of special needs help at Southmead Primary School) on three dependent variables, reading and spelling ages and the results of the self-report questionnaire.

The results of the present study found a significant increase in the reading and spelling ages of the participants after having used the TTRS program for a period of about 4 months, at a significance level of (.006) and (.005) respectively. No significant difference was found between the Saturday club group and Southmead School group in their improvement in reading or spelling ages. The analysis of the questionnaire revealed an overall positive evaluation of the TTRS program by the participants, with many being of the opinion that the TTRS program had improved their reading and writing skills and increased their academic self-confidence and motivation. The results of an ANOVA revealed a significant group difference between the children from the Saturday club and the children from Southmead School in their evaluation of the effectiveness of the TTRS program.

## INTRODUCTION

"... the overwhelming majority of humans who have ever lived have been illiterate, and today I believe it is the case that a very large percentage, and perhaps the majority of the world's population have never had the opportunity to learn to read. Most of us come from families that four generations ago did not possess the ability to read" Geschwind, (1982). Before the last century the ability to read and write was restricted to a small minority, such as priests or professional scribes, however the last century has seen many changes with most developed countries aiming for universal literacy. To be illiterate these days is to be at a profound disadvantage as modern societies assume that their adult members can read (Ellis, 1993). When taking into account that it was around the end of the 19th century that society started to aim for universal literacy, it is not surprising that it was also around this time that scientists started to report accounts of children with unexpected difficulties in learning to read.

### Dyslexia

About a 100 years ago the first accounts appeared of children who, despite normal or above-normal intelligence, apparently normal hearing and eyesight, and an adequate home background, had unexpected difficulty learning to read and write, (Ellis, 1993). Credit for the first systematic reports of unexpected reading difficulties in children is usually shared between two British doctors, James Kerr and Pringle Morgan, both of whom presented their ideas publicly in 1896. A pioneering figure in the field of dyslexia was the medical researcher James Hinshelwood, who wrote a series of medical journals before publishing his book 'Congenital Word Blindness' in 1917. It was from Hinshelwood's early work that the present understanding of this learning difficulty has developed. He believed that dyslexia was a congenital disorder associated with the left cerebral hemisphere of the brain which prevented the normal development of reading skills in children who were otherwise able and intelligent, (see Snowling, 1985). Dyslexia is commonly defined as: "a disorder manifested by difficulty in learning to read despite conventional instructions, adequate intelligence, and sociocultural opportunity" (Crichtley, 1975).



### *The difficulties dyslexics encounter*

Specific learning difficulties and dyslexia are terms used to describe a particular range of problems encountered by some learners. They are a heterogeneous group and show problems in any or all of the following areas: reading, spelling, sequencing, determining between left and right, visual discrimination and perception, auditory discrimination, pronunciation, long-term and short-term memory and organisation (NCET, 1992). Dyslexia affects around 5% of the population (Miles & Haslum, 1989) and is typically diagnosed in average or bright children who show exceptional difficulty in learning to read. Not only do dyslexics have difficulty in learning to read, their performance is characterised by poor spelling, in particular the production of bizarre errors, based on letter combinations that are not normally found in the English language (see, Miles, 1983). According to Frith (1985) it is now well established that spelling deficits in dyslexic children typically prove more intractable than the reading deficits on which the original diagnosis of dyslexia is based.

Dyslexia can affect many skills in the class room such as reading, writing, studying, comprehension exercises, note-writing, essay writing, using tables, number facts, drawing maps, handling chemicals and learning foreign languages. One of the major problems to be faced in describing the classroom effects of dyslexia is that dyslexic children do not all show a standard group of weaknesses. When the dyslexic child first goes to school their learning difficulties have often not yet been recognised, and many teachers are still not adequately trained to deal with such information processing problems in children (Snowling, 1985). The dyslexic child's reading progress is slow and uncertain and his/her attitude to the printed word may become increasingly hostile. When it comes to writing a child needs to express their ideas in sequence in symbols written on paper, a dyslexic child has difficulty in locating where he/she should start on the page, has problems controlling the required letter shapes, has great difficulty in turning his/her bright ideas into verbal form, and expresses great problems in translating the shape/sound idea of the word into the movement pattern for letters, (Snowling, 1985).

## **Computers and specific learning difficulties**

When taking into account the difficulties children with dyslexia can experience with language acquisition and other areas one becomes aware of the great need for expert help for such children. Much research has been carried out on developing the most effective methods for teaching children with such difficulties, and with some success, however expert help is not always available. In the last two decades thanks to technology things could be looking up for dyslexics as many people believe that computers are the new way forward for people with such learning difficulties.

Computers do seem to have a lot to offer those with specific learning difficulties, some of the following were suggested by the NCET (1992): overlays can provide useful prompts for the beginner writer while predictive word processors can extend the range of words a writer can use. Standard word-processing packages offer opportunities for drafting and redrafting a document very quickly which can encourage reluctant writers to be more adventurous and more critical of their work. The professional appearance of the finished product is a boost to self-esteem and spell checkers can remedy many of the spelling problems which bedevil the student's work. Computers can also be of assistance with reading especially in the early stages when speech synthesisers can support the learner who is struggling to phonetically decode phonic words while programs such as Developing Tray and Speed Read can promote the more advanced reading skills of prediction, skimming and scanning (NCET, 1992). For a guide to IT. software for specific learning difficulties see NCET (1994).

## **Studies of remediation programs for dyslexic children**

A study by Fawcett, Nicolson and Morris, (1993) compared the effectiveness of two computer-based spelling remediation programs for dyslexic children. Both programs provided a multi-media environment for dyslexic children which used synthesised speech to augment the written text. One program was the SelfSpell which encouraged the users to enter a rule to help them remember how to spell each word the other program used a mastery learning technique for learning spellings. The participants consisted of a group of 10-11 year old dyslexic children who used the programs for a week. Both programs were found to be effective at improving



spelling immediately after having used the programmes and one month later. It was suggested that the multimedia presentation approach may have provided a uniquely effective method for helping dyslexic children to acquire the 'alphabetic' stage of linguistic processing (Fawcett et al. 1993).

Elkind, Cohen and Murray (1993) investigated the effectiveness of using computer-based readers to improve reading comprehension of students with dyslexia. The computer based readers employed a document scanner, optical character recognisor, speech synthesiser, and visual display to convert printed text into spoken text so that the user could simultaneously listen to the text and read it visually. The computer based readers were thought to be a compensatory aid that would reduce the stress associated with reading and allow children to read independently without the aid of a tutor. The children in the study used the computer-based reading system for one-half a day per week for a semester. The system proved to be a strong compensatory aid enabling 70 percent of the students to read with greater comprehension, equalling approximately one grade level or more improvement. However not all the students benefited, fourteen percent showed lower comprehension scores when using the system. Elkind et al. (1993) found some indication that this degradation was associated with kinesthetic-motor weaknesses.

Lowenstein (1997) evaluated the effectiveness of a programme to improve the reading ages of dyslexic children. Fifty children at a residential school for children with psychological and behavioural problems, who additionally had mild to moderate dyslexia made up the sample of participants. Participants were randomly assigned to two groups, both groups received the same education and therapy apart from the experimental group were also included in a program to help with their dyslexia. The mean reading ages of the two groups were initially comparable, at the end of the year the reading ages of the experimental group had improved significantly (Lowenstein, 1997). The remedial program for the experimental group lasted for 45 minutes daily for a year. The program used a multi-sensory technique e.g. after letters and sounds of letters were learned, children learned the sounds of phonic elements, followed by the use of words. Two approaches to teaching were used, the first used the Alpha to Omega Flash Cards and the second used the Lowenstein's 'Bingo Cards', for further details on the two methods see Lowenstein (1997).

### *Dyslexics, motivation & locus of control*

When working with children with dyslexia one may get the impression that they are lacking in motivation towards their academic work, which could be due to a number of reasons such as frustration. Locus of control describes the degree to which an individual believes that reinforcements are contingent upon their own behaviour, individuals who believe that reinforcements are largely consequences of their own behaviour are considered internal in locus of control, whereas their counterparts who conceptualise that consequences are the result of forces outside of themselves are considered external in locus of control (Bosworth et al, 1983). Locus of control appears to be related to personal effectiveness, with individuals with an internal locus of control being higher in achievement motivation. However research investigating motivation and locus of control in children with specific learning disorders is relatively rare.

Hisama (1976) found no significant difference in locus of control between learning-disabled and normal children. In a study by Bosworth and Murray (1983) dyslexic and normal children were assessed on internal versus external locus of control and on achievement motivation. This was measured using formal questionnaires and ratings by teachers. The results indicated less internal locus of control for academic success and general life situations in dyslexic children. These suggests that dyslexic children may feel that they have a lack of control over their academic progress, which they feel is due to forces outside of their control. A significant relationship was also found between internal locus of control and achievement motivation in dyslexic children. Hence the dyslexic children higher in internal locus of control were also more achievement motivated, which suggesting that it would be beneficial to motivation to try and promote an internal locus of control in dyslexic children.

### *Dyslexics and self-confidence*

Children with specific learning disabilities have been shown to experience a lack of confidence in approaching academic tasks (Harter 1990). It was suggested by Westervelt et al. (1998) that the presence of a negative self-concept in regard to a certain academic skill area can be a factor in the future development of that skill e.g. Marsh (1990) reviewed findings (Meece et

al. 1982; Relich 1983; Marsh, Smith, and Barnes 1985) that indicated that, relative to boys, fifth- and sixth-grade girls have higher maths achievement levels but lower maths self-concept. Interestingly by high school, girls maths achievement is significantly lower than boys, thereby falling in line with their previously evident lower self-concept in maths (Marsh, 1990). Although a multitude of factors may be at play, such a pattern suggests that a socialisation process, as reflected by self-concept, may precede and influence later achievement differences (Westervelt et al. 1998). It was put forward by Westervelt et al. (1998) that such a process could further impair learning disabled children who do not feel they have the potential to improve deficit skills.

The impact of a six-week multimodal summer camp program on the self-concept and reading/writing skills of a group of dyslexic students was assessed in a study by Westervelt et al. (1998). This study by Westervelt et al. (1998) is one of the very few studies to look at changes in the self-concept of dyslexic children after introducing interventions to improving literacy skills. The subjects were campers aged between 9 and 14 years, and came from public, private, and specialised private schools serving students with learning disabilities (LD). Some of the campers had been diagnosed as suffering from comorbid disorders such as attention deficit disorder (ADD) and attention deficit hyperactivity disorder (ADHD).

There were many interventions in place at the summer camp ranging from academic to psychosocial. The academic interventions consisted of tutorials employing the multisensory and phonetics-based methods of language instruction (Orton-Gillingham). The psychosocial interventions consisted of the general theme of the camp, which was to enhance self-concept, by taking every opportunity to praise children, creating an environment in which a child can succeed and prompting campers to be esteem builders among themselves (Westervelt et al. 1998). The campers also participated in a number of physical and creative activities in the afternoons.

The results of Westervelt's et al. (1998) study showed that: campers improved significantly in phonetic reading and spelling skills, but not in sight word vocabulary or reading speed. Campers also exhibited significant improvements in self-concept, both on a general level and in the specific areas of reading and overall academic competence (Westervelt et al. (1998). It was found by Westervelt et al. (1998) that the kinds of changes observed on the more general

measures of self-concept, were not the same for the various groups of campers. Campers from regular private schools and from public schools typically experienced greater gains in general self-concept than did campers from LD private schools (Westervelt et al. 1998). The explanation given for this difference was the possible effect of the children's reference group, e.g. children from the specialised LD schools are taught with students who are of a similar ability, and experience similar difficulties as themselves, whilst the private and public school children came to camp with an academic self-concept referenced against a more competitive academic peer group. Campers with diagnosed comorbid disorders typically realised little or no gains, whereas campers without ADD or ADHD displayed significant improvements in general self-concept (Westervelt et al. 1998).

### *The Touch-type, Read and Spell Computer Course*

The touch-type read and spell computer course (TTRS) is a multi-sensory computer aided learning program, which uses seeing, hearing, speaking and touching, for children and adults with spelling, reading or writing difficulties. The TTRS program is based on the textbook 'Alpha to Omega' by Beve Hornsby, Frula Shear and Julie Pool (19 ). The purpose of the TTRS course is to develop the literacy skills of its users, whilst at the same time raising their level of confidence, self-esteem and motivation. The TTRS program claims to promote learning by: i) using a multi-sensory approach, ii) being a planned programme that is finely graded, structured and computerised, iii) promoting immediate self correction of errors and iv) providing feedback of the results. The success from the very first module is thought to build greater motivation and self esteem and finally the focus and support for a positive learning experience.

The TTRS program comes on an a drive disc, or the speech version is a CD ROM, they can be used on a PC version DOS 486 or above with or without CD ROM drive/sound card (16 bit). Once the program is installed the user has a series of courses to work through, each consisting of 30 modules, which vary from coping exercises to dictation's. The student is required to site correctly at the computer with his/her fingers on the home keys, so they learn to touch-type correctly. The TTRS uses a method where the key bord is displayed on the computer screen. On the key bored display the yellow fingers are shown on the home keys and the finger which is to be used to print the word will be displayed in read and go to the correct key, this enables



the user to not remove his/her fingers from the home keys or look at the key board when typing. This is not only thought to help the user learn to touch-type efficiently, but to create a kinaesthetic sensation of movement, when spelling a word. When the user reaches the end of a module a percentage score of accuracy is displayed and the number of words per minute that they typed. The program stores a record of the student scores for each module, this information is displayed when the student access his/her history, which is displayed in graphical form.

There appeared to be a shortage of evidence to support the claims the program made, such as improved reading, writing, spelling, confidence, motivation etc.. There was some evidence available to support the claims made by the program, such as the initial observations by Vanessa Charter (Jan, 1998), however this study used observational methods and no statistical analysis was used. Effectively evaluating the Touch Type Read and Spell program would be of interest not only to the maker of the TTRS program Philip Alexandre, but teachers of children with special needs, parents of children with reading and writing difficulties and anyone wanting to purchase the program.

### **The Theory behind the TTRS computer aided learning program**

The TTRS computer aided learning program is based on the book 'Alpha to Omega' by Beve Hornsby, which provides a programme based on the work of Anne Gillingham and Bessie Stillman, who in conjunction with Samuel T. Orton began to devise a phonetically based scheme for the teaching of dyslexics in the 1930s. This was later expounded in the UK by Sally B. Childs. The program was built up over four years of clinical observation of what it is that the dyslexic finds so difficult. Training aims to shape these weaknesses so that they can be overcome. The TTRS uses the phonetic, linguistic approach to the teaching of reading, writing and spelling. The program works on the principle that the ability to read the printed word and the ability to write down words are all part of a language ability as a whole, and all these areas should be taught and improved concurrently. Improving these skills will increase the pupil's understanding and experience of language as a whole (Hornsby, 1976). The program is highly structured, the structure closely follows the normal pattern of phonological and language acquisition: each step leads naturally and logically one into the other, and at no point is the pupil required to read or write any spelling pattern or language structure which has not been

specifically taught. Therefore, everything he/she is asked to do is completely comprehensible, failure is eliminated and errorless learning takes place, Hornsby (1976), (for further information on the program see 'Alpa to Omega' by Beve Hornsby, (1976)).

The TTRS program has used this phonetic, linguistic approach and combined it with the advantages a computer has to offer a person with specific learning difficulties in an attempted to create a successful learning aide. The TTRS program also teaches the user the useful skill of learning to touch type which will enable them to use a word processor more effectively and increase their confidence at using a computer.

### **Previous evaluations of the TTRS computer program**

Initial observations of the TTRS (Touch Type Read and Spell IT disc) and TTRHS (Touch Type read Hear and Spell CD ROM) were carried out by Vanessa Charter in January 1998, for the Nottinghamshire Dyslexia Association Trustees. Charter (1998) observed that during a simple introductory session, students adapted to the positive reinforcement teaching modules, and with the learner being in control of the pace and content of the modules, it seemed to create an independent and successful learner. This she felt would automatically lead to improve self-esteem. Charter (1998) pointed out that in order for learning to occur and for a learning session to be successful the conditions must be right e.g. the learner must show motivation, concentration, use visual, auditory, kinaesthetic and haptic skills, the environment must be relaxed, the teacher or helper must have rapport with the student, learning must be segmented into manageable sections and finally the learning process involves memory so using repetition is helpful. Charter (1998) felt that if the teaching programme is structured and develops in small steps, with plenty of reinforcement and presented in the style of the learner, memory and transference of knowledge will be automatic.

Vanessa Charter (1998) also carried out a TTRS update after the delivery of the first ten week course, and found that if the course is delivered correctly it appears to be effective. It was found that after the first week or two of the course students settled down and developed a good work ethos which pleased them and their parents. Charter found that students varied on the level of intervention and praise they required, so parents and helpers were asked to agree on communication before the session or module. It was observed that the fidgety somewhat

clumsy, often impulsive learners tended to crash about on the keyboard and jump up to take breaks, but once they understood the programme and 'felt' their way through the first three weeks, they became more calm. It was found that these tactile learners showed impressive touch typing skills and increased concentration, and of all the students it was felt that these received the most rewards in-terms of increased parental admiration and self-esteem.

A pilot study of the suitability of the TTRS course for visually impaired children was carried out by Jean Cavanagh which began in November 1997 and ended in July 1998 (Cavanagh, 1998). The study consisted of five children aged between 8 and 10, and was carried out in an integrated setting with the parent/carer remaining with their child throughout the hour session which took place once a week. It was found that the TTRS program had a large number of advantages for visually impaired children e.g. access for all visually impaired children, through a multi-sensory approach etc. At the end of the pilot it was concluded that there were a large number of advantages arising from the weekly sessions, such as improving their literacy skills and helping them to develop touch typing skills, improved confidence and self-esteem contributing to a positive attitude towards other areas of learning.

### **The Pentonville Prison study**

It has been estimated that up to a third of inmates are dyslexic which is a extremely high percentage when one considers that in the general population it is though to be 4-5% (Newnham, 1999). Amphlett (1999) pointed out that there is no causal link between dyslexia and criminality and says that diminished self-esteem is the factor which puts so many dyslexics children on the wrong track. Amphlett's aim is to reach all the dyslexic inmates among Pentonvill's 1,100 men, to give them self-confidence, a better hope of employment and a way out of crime. The Pentonvill Prison program was set up in August 1998 by the prison's education service-run on contract by Amersham and Wycombe College - in partnership with the British Dyslexia Association and local dyslexic groups. The project secured a £8,500 from the national Year of Reading to invest in computers and the TTRS software package. All volunteers took an initial test followed by an hour-long diagnostic assessment. All were found to be dyslexic and they joined a long waiting list (Bradford, 1999). The study at Pentonvil prison is the biggest study involving the TTRS computer aided learning program and to date they have been experiencing much success.

## AIMS & HYPOTHESES

### Reading & Spelling ages

The present study aimed to determine if introducing the TTRS computer program to dyslexic children, would improve their reading and spelling skills. Most of the research (e.g. Fawcett et al., 1993; Elkind et al., 1993; Lowenstein, 1997) investigating the effects of introducing a multi-sensory reading and writing remediation program to a population of dyslexics children has found that the interventions significantly improved reading and spelling skills in the majority of the participants. Hence it was predicted that in the present study that using the TTRS program would significantly improve the children's reading and spelling ages, above what one would expect them to improve during the 4 months experimental period.

**Experimental Hypothesis 1.** There will be a significant improvement in both the reading and spelling ages of the children having used the TTRS program. The rate of improvement will be greater than expected without the use of an intervention program.

**Null Hypothesis 1.** There will be no significant improvement in both the reading and spelling ages of the children having used the TTRS program. The rate of improvement will not be greater than expected without the use of an intervention program.

Two groups of participants were used in the study; one group consisted of dyslexic children who voluntarily attended a Saturday club where they used the TTRS program. The second group consisted of dyslexic children from Southmead Primary School who used the TTRS program as part of their special needs help at school. Hence it was predicted that there may exist a motivational difference between the two groups. Due to this possible motivational difference, the second aim of the study was to determine if there existed a group difference in the improvements made in reading and spelling ages.

**Experimental Hypothesis 2.** There will be a significant group difference, between the children from the Saturday club and the children from Southmead School in the improvement made in reading and spelling ages.

**Null Hypothesis 2.** There will not be a significant group difference, between the children from the Saturday club and the children from Southmead School in the improvement made in reading and spelling ages.



Many of the studies (Elkind et al. 1993; Lowenstein, 1997) evaluating the effects of multi-sensory remediation program on the reading and spelling of dyslexic children, have found that some children experience greater benefits from the programs than other children. The present study predicted that some children would experience greater benefits from using the TTRS program than others. The third aim was to determine if this was the case.

**Experimental Hypothesis 3.** There will exist a significant correlation between the difference of reading age 2 and expected reading age 2 with the difference between spelling age 2 and expected spelling age 2.

**Null Hypothesis 3.** There will not exist a significant correlation between the difference of reading age 2 and expected reading age 2 with the difference between spelling age 2 and expected spelling age 2.

### **Questionnaire results**

The fourth aim of the present study was to evaluate the children's opinions of how effective they felt using the TTRS program was at improving their reading and spelling skills and increasing their academic motivation and self-confidence. The children were also asked about their opinions of different features of the TTRS program e.g. being able to look at their 'history scores'. In a similar study by Westervelt et al. (1998) it was found that children exhibited significant improvements in self-concept scores, which were measured using self-report questions, hence it can be assumed that during such remediation programs children are able to notice positive changes within themselves. It was predicted that the TTRS program would receive a positive evaluation from the children, as they would be noticing positive changes due to using the TTRS program.

**Experimental Hypothesis 4.** The TTRS computer program will receive a positive evaluation from the participants (scores above 50%).

**Null Hypothesis 4.** The TTRS computer program not will receive a positive evaluation from the participants. (scores below 50%).

Due to children from the Saturday club using the TTRS program voluntarily and the children at Southmead School using the program as part of compulsory lessons, it was predicted that the children from the Saturday club may be more kindly disposed towards the TTRS program, than the children from Southmead School.

**Experimental Hypothesis 5.** There will be a significant difference between the Saturday club children's evaluation of the TTRS computer program and the Southmead School children's evaluation of the TTRS program.

**Null Hypothesis 5.** There will not be a significant difference between the Saturday club children's evaluation of the TTRS computer program and the Southmead School children's evaluation of the TTRS program.

Another aim of the study was to determine if some of the participants had a general positive or negative attitude towards the TTRS program and evaluated all six aspect of the program highly or poorly, or whether participant varied on which aspects of the program the liked and disliked e.g. evaluation TTRS ability to improve reading highly but to increase motivation poorly.

**Experimental Hypothesis 6.** The children who evaluated certain aspects of the TTRS program most positively will be the same children who evaluated other aspects of the TTRS program most positively, i.e. scores will have a positive correlation.

**Null Hypothesis 6.** The children who evaluated certain aspects of the TTRS program most positively will not be the same children who evaluated other aspects of the TTRS program most positively, there will be no correlation.

### **Reading & spelling ages with questionnaire results**

The present study wanted to determine if the children who gave high evaluation scores on the questionnaire, for TTRS ability to improve their reading, spelling and academic self-confidence where the same children who had improved the most in their reading and spelling ages. In other words did perceived improvement (questionnaire results) correlated with actual improvement (reading & spelling ages)?

**Experimental Hypothesis 7.** There will be a significant correlation between evaluation scores of TTRS's effectiveness at increasing confidence and the difference between expected reading and spelling ages 2 and actual reading and spelling ages 2 (two tailed).

**Null Hypothesis 7.** There will not be a significant correlation between evaluation scores of TTRS's effectiveness at increasing confidence and the difference between expected reading and spelling ages 2 and actual reading and spelling ages 2 (two tailed).

**Experimental Hypothesis 8.** There will be a significant correlation between evaluation scores of TTRS's effectiveness at improving reading skills and the difference between expected reading age 2 and actual reading age 2 (two tailed).

**Null Hypothesis 8.** There will not be a significant correlation between evaluation scores of TTRS's effectiveness at improving reading skills and the difference between expected reading age 2 and actual reading age 2 (two tailed).

**Experimental Hypothesis 9.** There will be a significant correlation between evaluation scores of TTRS's effectiveness at improving writing and spelling skills and the difference between expected spelling age 2 and actual spelling age 2 (two tailed).

**Null Hypothesis 9.** There will not be a significant correlation between evaluation scores of TTRS's effectiveness at improving writing and spelling skills and the difference between expected spelling age 2 and actual spelling age 2 (two tailed).

# **METHOD**

## **Design**

### **Reading & Spelling Ages**

The Schonell graded spelling and the Schonell graded word reading test's were administered to each participant before and after the introduction of the quasi-independent variable, to gain a reading and spelling age of each participant. A pretest-posttest quasi-experimental design was used, with two pre-existing independent groups. The experiment used a mixed 2 x 2 Factorial Design to analyse the effects of 2 quasi-independent variables on two dependent variables (Quantitative):

### **Quasi-Independent Variables**

1. Experience with the Touch Type Read and Spell (TTRS) computer aided learning program:
  - (i) Before having started to use the TTRS program
  - (ii) After having used the TTRS program for a few months
2. The group the participants were in:
  - (i) The Saturday club group, who used the program voluntarily
  - (ii) The School group, who used the program as part of compulsory special needs help

### **Dependent Variables**

1. The participants performance on the Schonell graded word reading test
  - (i) Before having used the TTRS program
  - (ii) After having used the TTRS program
2. The participants performance on the Schonell graded spelling test
  - (i) Before having used the TTRS program
  - (ii) After having used the TTRS program

This yielded 4 experimental conditions under which each dependent variable was tested. The ratio data obtained from experiment 1 was statistically analysed in relation hypothesis 1- 4.

## **Questionnaire Results**

A self-administered questionnaire was distributed to each participant at the end of the experimental period i.e. after each participant had been using the TTRS program for a few months. The questionnaire was designed by the experimenter for the purpose of evaluating the participants opinions of the effectiveness of the Touch Type Read and Spell computer aided learning program in relation to 5 different areas, which were the dependent variables, (See appendix B for the questionnaire).

## **Independent Variable**

1. The group the participants were in:

- (i) The Saturday club group, who used the program voluntarily
- (ii) The School group, who used the program as part of compulsory special needs help

## **Dependent variable**

1. Attitude towards the TTRS program in relation to 5 different areas:

- (i) Improving the participants reading skills
- (ii) Improving the participants writing and spelling skills
- (iii) Increasing the participants level of self-confidence in relation to literacy skills
- (iv) Increasing the participants level of motivation towards literacy skills
- (v) And the participants opinion of some of the different features of the TTRS program

The Interval data obtained from the questionnaires was coded, input on SPSS and analysed to establish the effect of the program on the children's attitudes towards their reading, writing, motivation & self-confidence.

## **Modifications**

Originally the experiment had planned to use The Piers-Harris Self-concept Scale, to assess whether the participants academic self confidence had changed after having used the TTRS program. However the experimenter was unable to obtain the tests, as the university was unable to contact the company who sells the psychometric tests in America, as a result the self-report evaluation questionnaire was designed, specially for the purpose of this study.



## **Participants**

### **Sampling**

The experimenter had prior acquaintances with the staff and some of the children at the Rescue Foundation in Wales. As the Rescue Foundation was the only establishment in the area that were using the TTRS program the children who were going to attend the Saturday club were selected to be the participants for the evaluation of the TTRS program. The experimenter then contacted the maker of the TTRS program Philip Alexandre, for some contacts of other establishments using the TTRS program. Only one sample met the requirements, this was a primary school in Merseyside, which made up the second group of participants. The requirements for the participants were that they had just started using or were about to start using the TTRS program, would be using the program for 1-2 hours each week, were school age and experienced some reading and writing difficulties.

### **Participants**

In total 13 participants with reading and writing difficulties took part in the study, some of the participants were statemented as being dyslexic or having a specific learning difficulties, however being statemented was not a requirement. The participants consisted of 7 children from the Saturday club, 5 boys and 2 girls, aged between 9 and 12. From Southmead Primary School there were 6 participants, 3 girls and 3 boys, all aged between 8 and 11. All the participants from the Saturday club were thought to be dyslexic and attended the Saturday club voluntarily with the aim of improving their reading and writing skills. The participants from South mead Primary school were all described by their teachers as having learning difficulties with reading and writing and used the TTRS program during school time as part of special needs help.

## **Materials**

1. The Schonell graded spelling test, level 2, (1976) refer to *appendix A* for the test sheets. The spelling test requires the participant to spell a number of graded words, to give them a 'spelling age'. The method involves the experimenter/tester saying the word to be spelt aloud, followed by the word said in a sentence, followed by the word said on its own once more. The

graded words to be spelt start off easily e.g. cut, mat and then become progressively harder concluding with words such as: miscellaneous. Testing is discontinued when 10 consecutive words are incorrect. The spelling age is obtained by dividing the number of words correctly spelt by 10 and then adding 5, e.g. if a child spells 25 words correctly they would have a spelling age of  $25/10 = 2.5$ ,  $2.5 + 5 = 7.5$ .

2. The Schonell graded word reading test, level 2, (1976) refer to *appendix A* for the test sheets. This test requires the child to read out aloud a series of graded words, to obtain a 'reading age'. Again the words start off simply e.g. 'tree' and become progressively harder e.g. 'somnambulist'. Younger or weaker readers start the test at the beginning, whilst better readers can start at a later group of words. If any word in the group of 10 is failed the preceding group of 10 words is given until all 10 are read correctly. The child will then continue to read out the words until they become too difficult, and the child does not wish to continue. The score is the total number of words correctly read, which is looked up on a table of the norms which provides a reading age.

3. The TTRS evaluation questionnaire, refer to *appendix B*, this was designed by the experimenter for the purpose of evaluating the participants opinions of the TTRS program. The questionnaire was designed by studying the brochure of the TTRS program and basing the questions on elements which the brochure claimed to improve. The questionnaire consisted of 34 questions which were based on 5 topic areas: improving spelling and writing, improving reading, increasing motivation, increasing self-confidence and finally different features of the program. The participants responded on a Likert scale of strongly agree, agree, don't know, disagree and strongly disagree, to statements which were either positive or negative in relation to the TTRS program. The responses were scored on a 1-5 scale with the most negative attitude towards the TTRS program scoring 1 and the most positive scoring 5, so the higher the overall score the higher the participants evaluation of the TTRS program. An example of a statement in the questionnaire is: Since using the TTRS program I am not as worried about being asked to read aloud in class.

4. The Touch Type Read and Spell computer aided learning program (Version 5.3) by Philip Alexandre and a PC. This was not involved directly in the experimental procedure, but was the main independent variable in the experiment. The participants used the program either at a Saturday club or in school and then evaluated it after having used it for a period of 4 months. Other materials involved SPSS for the analysis and pencils and erasers for the tests and questionnaire.

### **Pilot Study**

The experimenter attended a summer school for children with dyslexia where the TTRS program was being used on a trial basis before the centre considered purchasing it. At the summer school the experimenter was able to observe the program in use and learn something about the children's initial impressions of the program.

Before the start of the study the experimenter interviewed 6 children who were later participants in the study. In the short informal interview the children were asked about their reading and writing difficulties, their likes and dislikes in school etc. and what their initial impressions of the TTRS program were when they used it at the summer school. This gave the experimenter some insight and knowledge which assisted in design of the study.

### **Procedure**

There were 8 children attending the Saturday club who would be using the TTRS program. On the first Saturday of Saturday club all the children and their parents attended, and were given a consent form which informed them of the nature and the purpose of the study (refer to appendix C). The experimenter also explained to the parents in greater detail the nature and purpose of the experiment and expressed her gratitude for their co-operation. All the parents signed the consent form however only 7 of the 8 took part in the experiment as one child was too timid and did not wish to take part. Another participant ceased attending Saturday club before the end of the experimental period, he was not tested for a reading and spelling age a second time so his reading and spelling ages data was not used, however he did complete an evaluation questionnaire and the results were used.



At the Saturday club 7 children were tested for their reading and spelling ages individually in a quiet room by the experimenter according to the manual instructions, see *appendix A*. Before the testing began the experimenter thanked the participant for taking part in the experiment and put them at ease by informing them it did not matter ~~how~~<sup>how</sup> well they did on the test but to try their hardest. The participants were allowed to choose which of the two tests (reading or spelling) they wished to do first, at the end of the tests the experimenter thanked the participants again for taking part.

The experimenter went to Southmead Primary school to introduce herself and explain to the teachers involved and the children using the TTRS the nature of the experiment and its purpose. Consent forms were handed out to the teacher in charge of the TTRS program, which were then passed on to the parents of the children using the TTRS program. A week later the experimenter returned to carry out the testing. All the consent forms were returned, out of the 7 children using the TTRS program 6 were tested as one child was absent from school. Testing was carried out in the same uniform procedure as at the Saturday club.

A period of 4 about months then passed before the participants were tested on their reading and spelling ages again (6 from the Saturday club & 6 from Southmead School). The Schonell reading and spelling tests were administered using the same standardised procedure as when the participants were tested 4 months prior.

All the participants (7 from the Saturday club & 6 from Southmead School) were then administered with the TTRS evaluation questionnaire, to gain information on the participants' opinion of the effectiveness of the TTRS program. A self-administered questionnaire was chosen to control against experimenter effects and encourage honest answers. All the participants were assured of anonymity and confidentiality, and received verbal instructions before completing the questionnaire. Due to the participants' reading difficulties the experimenter read out the questions, if any of the questions were not understood the experimenter explained the question as simply as possible. The participants were tested in their groups to sustain a uniform procedure within the group and the experimenter endeavoured to sustain a uniform procedure between the two groups. All the data was analysed using SPSS (see appendix D for raw data).

## ***RESULTS***

### **Experiment 1: Reading & Spelling Ages**

#### **Modifications**

The first reading and spelling ages were not compared with the second reading and spelling ages, as any difference found could be due to maturity during the experimental period. For each participant an expected second reading and spelling age was calculated using an 'achievement ratio', which charts the improvement in attainment over a year. For non-dyslexic children, this ratio is 1.00 on average (improvement of 12 months in a year), whereas for dyslexic children, Thomson (1984) recorded typical ratios of 0.40 for reading and 0.27 for spelling (improvements of only 5 months and 3 months respectively in any 12-month period).

For the Saturday club group the time period between test 1 and 2 was 4.8 months, using the ratio of 0.4 and 0.27 respectively one would expect the reading ages to have improved by 2 months and their spelling ages to have improved by 1.2 months between test 1 and 2. For the Southmead school group the time period between test 1 and test 2 was 3.7 months, so one would expect an improvement of 1.5 months for the reading ages and 0.9 months for the spelling ages. These expected improvements were added on to the first reading and spelling age of each participant to make up the expected second reading and spelling ages. Improvement in reading and spelling ages, over the period during which children used the TTRS program is thus the difference between expected reading and spelling ages and the actual scores achieved.

To simplify the calculations all the data in the tables and graphs of the reading and spelling ages of the participants is presented in months not years.

#### **Descriptive Statistics**

SPSS was used to calculate the mean and standard deviations for reading and spelling ages on both occasions. The expected second reading and spelling ages and the difference between expected second reading and spelling and actual second reading and spelling ages were also

calculated. These calculations were made for the Saturday club, Southmead School and both groups together.

**Table 1. The mean and Std for all reading and spelling ages as a function of experimental group and occasion of test.**

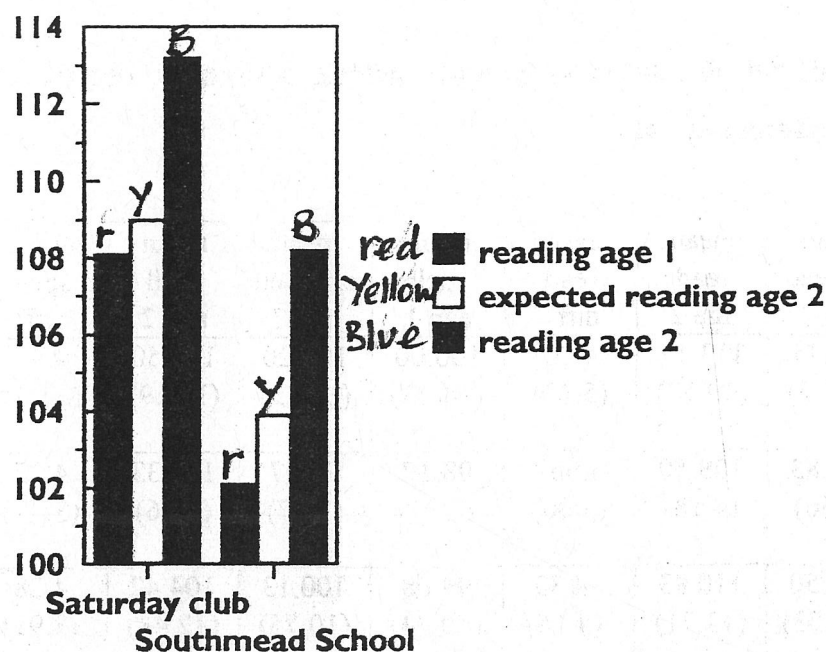
	mean read age 1	mean ex. read age 2	mean read age 2	mean read diff.	mean spell age 1	mean ex. spell age 2	mean spell age 2	mean spell diff.
Sat. Club	108.17 (14.57)	109.17 (14.95)	113.17 (19.57)	4.00 (5.33)	100.00 (14.23)	101.20 (14.23)	105.50 (17.69)	4.30 (4.23)
South- mead School	102.33 (3.56)	103.83 (3.56)	108.50 (4.18)	4.667 (3.06)	98.17 (7.03)	99.07 (7.07)	103.33 (5.16)	4.27 (3.97)
Sat club +South- mead	105.25 (10.56)	106.50 (10.73)	110.83 (13.71)	4.33 (4.16)	99.08 (10.74)	100.13 (10.75)	104.42 (12.48)	4.28 (3.91)

Table 1. Clearly illustrates that:

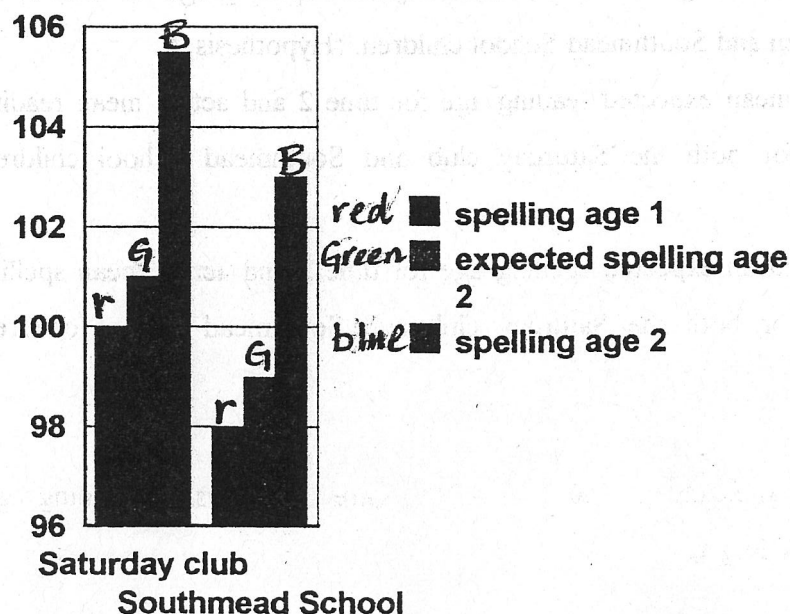
- (i) Mean reading age at time 2 is higher than the mean expected reading age 2 at time 2, for both the Saturday club children and Southmead School children. (Hypothesis 1).
- (ii) Mean spelling age at time 2 is higher than the mean expected spelling age for time 2, for both the Saturday club children and Southmead School children. (Hypothesis 2).
- (iii) The difference between mean expected reading age for time 2 and actual mean reading age for time 2 is similar for both the Saturday club and Southmead School children. (Hypothesis 3).
- (iv) The difference between mean expected spelling age for time 2 and actual mean spelling age for time 2 is similar for both the Saturday club and Southmead School children. (Hypothesis 4).

These results are repeated graphically in Figures 1 & 2, Figure 1 displays the reading ages whilst figure 2 displays the spelling ages.

**Figure 1. Mean reading age for time 1, mean expected reading age for time 2 & actual reading age for time 2, for the Saturday club children and the Southmead School children.**



**Figure 2. Mean spelling age for time 1, mean expected spelling age for time 2 & actual spelling age for time 2, for the Saturday club children and the Southmead School children.**

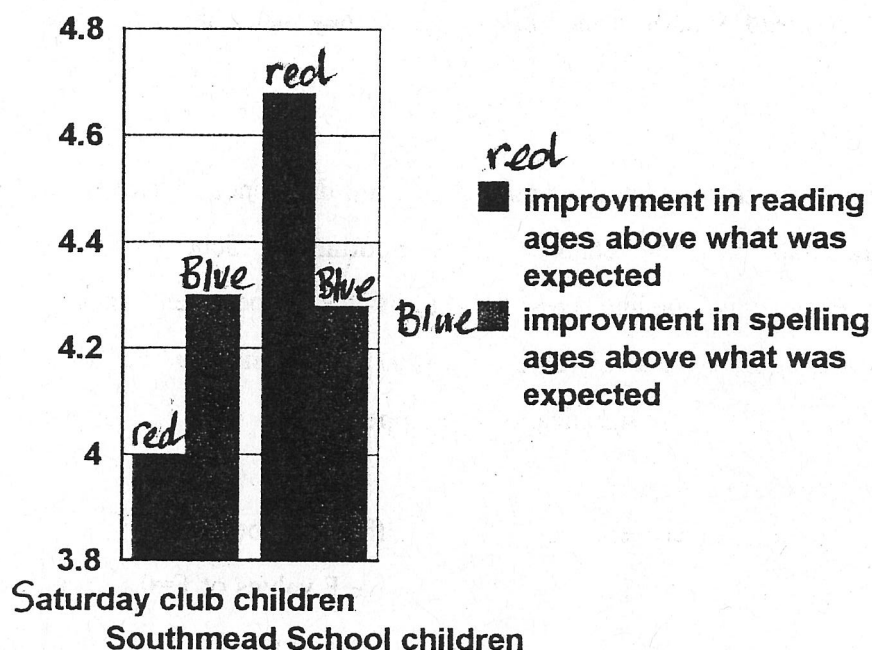




See figure 3 for both the Saturday club children's and Southmead Schools children's difference between expected reading and spelling ages for time 2 and actual reading and spelling ages for time 2. These results represent the improvements made in reading and spelling ages above what was expected during a 4 months period for dyslexic children. Figure 3 clearly illustrates that:

- (i) For the Saturday club the improvement in reading age above what was expected was 4 months. For the Southmead School children the improvement in reading age above what was expected was 4.7 months.
- (ii) For the Saturday club the improvement in spelling age above what was expected was 4.3 months. For the Southmead School children the improvement in spelling age above what was expected was just under 4.3 months.
- (iii) The improvements made in spelling ages were similar for both the Saturday club children and the Southmead School children. (Hypothesis 4).
- (iv) The improvements made in reading ages were greater for the Southmead School children, than the Saturday club children. (Hypothesis 4).

**Figure 3. The improvements made in reading and spelling ages above what was expected for time 2, for both the Saturday club and Southmead School children.**



## Inferential Statistics

Two-way ANOVAS with repeated measures on one account were chosen to analyse the results of the reading and spelling ages, and to test hypothesis 1 & 2. This is because an ANOVA allowed the experimenter to determine if there were significant group differences and significant differences between expected second reading and spelling age and actual second reading and spelling ages. Data will be tested at the 0.05 level of significance.

**Hypothesis 1:** There will be a significant improvement in reading and spelling ages of the children having used the TTRS program.

The results of the ANOVA test of within-subjects effect's of the difference between expected reading age 2 and actual reading age 2, and the difference between expected spelling age 2 and actual spelling age 2, gave F values of:  $F=11.933$  and  $F=13.079$  respectively, which were both significant at a 0.05 level of significance, (see appendix E). Overall the children exposed to the TTRS program showed higher reading and spelling ages than would be expected as they showed a faster rate of improvement than would normally occur simply due to maturation.

**Hypothesis 2:** There will be a significant difference between the children from the Saturday club and the children from Southmead School in the improvements they make in reading and spelling ages.

The results of the ANOVA testing if there existed a significant group difference (between the children from the Saturday club and the children from Southmead School) in the improvements they made in reading and spelling ages. Of the differences between expected reading age 2 and actual reading age 2 gave an F value of  $F=0.071$  and a  $\text{Sig.}=0.796$  which was not a significant result at the 0.05 level of significance (see appendix E).

The results of the ANOVA testing if there existed a group difference, between expected reading and spelling age 2 and actual reading and spelling age 2 gave F values of  $F=0.071$  and  $F=0.000$  respectively, neither of which were significant results, (see appendix F). Hence there was no significant difference in the improvements made in reading and spelling ages by the

Saturday club children who used the program voluntarily and Southmead School children who used the program as part of special needs lessons.

**Hypothesis 3:** There will be a significant correlation between improvements made in reading age and improvements made in spelling age.

To test hypothesis 3 a spearman's rank Correlation was performed, see table 2 for a summary of the results.

**Table 2. Summary results of Spearman's rank correlation coefficient between improved reading and improved spelling ages.**

Dependent variables	Difference between spelling age 2 and expected spelling age 2		
Difference between reading age 2 and expected reading age 2	Correlation Coefficient	0.589	(N=12)
	Significance (2-tailed)	0.044	

Table 2 illustrates that there exists a significant correlation between the difference between reading age 2 and expected reading age 2 and spelling age 2 and expected spelling age 2. This correlation indicates that the children who made the largest improvements in reading age were the same children who made the largest improvements in spelling age.

## **Evaluation questionnaire**

### **Descriptive statistics**

The average evaluation score and standard deviations of the five components of the TTRS evaluation questionnaire (improving reading skills, improving writing and spelling skills, increasing motivation, increased confidence, and the different features) and the total evaluation score were calculated for both the Saturday club children and Southmead School children, using SPSS, refer to table 3.

Percentage of the evaluation scores were then calculated, as some aspects of the questionnaire contained more question's than the others and hence scores could not be compared with each other. This was done by using the mean scores from table 3 divided by the maximum possible score for each variable, to determine which components of the TTRS evaluation questionnaire received the highest evaluation, see figure 4.

**Table 3. A table of the mean and standard deviations of the evaluation scores of the TTRS evaluation questionnaire for the Saturday club and Southmead School children.**

Evaluation of the TTRS program's ability to

Group	Features of the TTRS program	improve reading	improve writing & spelling	increase motivation	increase confidence	total evaluation score
Saturday club children	27.00 (3.92)	21.86 (5.01)	22.29 (4.68)	22.86 (3.48)	36.43 (7.87)	129.29 (21.19)
Southmead school children	17.67 (5.92)	17.50 (7.50)	21.17 (4.75)	19.17 (3.43)	32.50 (3.78)	108.00 (20.41)
Sat. club & S.mead	22.69 (6.92)	19.85 (6.41)	21.77 (4.55)	21.15 (3.83)	34.08 (6.26)	119.46 (22.80)

**Figure 4. The percentage of maximum evaluation score possible for each component of the TTRS evaluation questionnaire for both groups 1 & 2.**

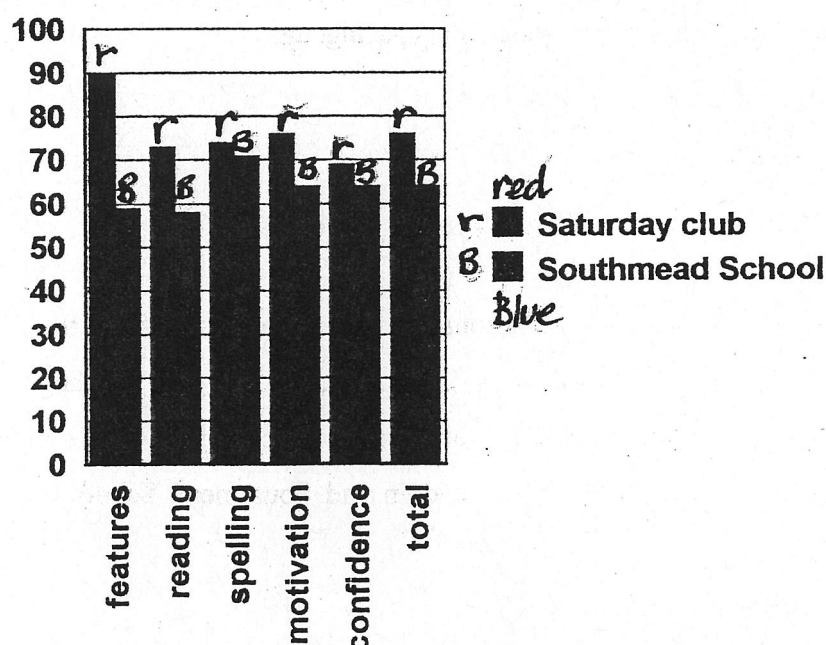


Figure 4. clearly illustrates that:

- (i) That all evaluation scores of the different aspects of the TTRS computer aided learning program were above 50%, which is the cut of point for a positive evaluation (Hypothesis 4)



(ii) The mean percentage of evaluation scores for Saturday club children were all higher than the mean percentage of evaluation scores given by the Southmead School children, (Hypothesis 5).

## Inferential Statistics

**Hypothesis 5:** There will be a significant difference between the Saturday club children's evaluation score of the TTRS program and the Southmead School children's evaluation score.

To test hypothesis 5, a one-way ANOVA with repeated measures was chosen, this was calculated using SPSS. The results of the ANOVA test of within-subjects effects of the difference between group evaluation scores gave an F value of  $F=3.193$  with a  $\text{Sig.}=0.013$ , which was a significant result at the 0.05 level of significance (see appendix G). This confirms that the Saturday club children who used the TTRS program voluntarily, evaluated the TTRS program significantly higher than the Children from Southmead School who used the TTRS program as part of compulsory special needs help.

**Hypothesis 6:** The children who evaluated certain aspects of the TTRS program most positively will be the same children who evaluate other aspects of the TTRS program most positively.

To test hypothesis 6, 3 Spearman's rank correlation's were performed using SPSS. The correlation's performed were TTRS's ability to increase: (i) motivation & self-confidence, (ii) self-confidence & reading skills, (iii) self-confidence & spelling skills. The Correlation Coefficient's and their level of significance (2-tailed) were calculated, the results are presented in table 3. All the correlation coefficients were tested at the 0.05 level of significance.

**Table 3. Summary results of Speaman's Correlation Coefficient for Increased confidence and a) increased motivation, b) improved reading skills and c) improved writing and spelling skills.**

Dependent Variables	increased motivation	improves reading skills	improves writing and spelling skills
increased confidence	Cor. Co. .802 Sig. .001	Cor. Co. .711 Sig. .006	Cor. Co. .729 Sig. .005

From table 3 one can see that:

- (i) That the children's self evaluation of how effective they felt using the TTRS program was at increasing their academic self-confidence correlated with their opinion of how effective they felt using the program was at increasing their motivation towards academic work.
- (ii) That the children's self evaluation, of how effective they felt using the TTRS program was at increasing their academic self-confidence, also correlated with their opinion of how effective they felt using the program was at increasing their reading and spelling skills.
- (iii) These three positive correlation's indicate that some children found the TTRS program generally more effective than others. The greatest association was between TTRS's effectiveness at increasing academic self-confidence and motivation.

### Reading & Spelling ages & Evaluation Questionnaire

#### **Correlation's**

**Hypothesis 7, 8 & 9:** Aimed to determine if the children's actual improvements in reading and spelling ages were associated with their self perceptions of their improvements in reading skills, writing & spelling skills, academic self-confidence and motivation, A number of correlation's were performed between the results of reading and spelling ages and questionnaires. Spearman's Correlation Coefficients were calculated using SPSS, all Correlation Coefficients were tested at the 0.05 level of significance. The results can be found in table 4.

**Table 4. Spearman's rank Correlation Coefficient's between the results from the reading and spelling ages and the questionnaires.**

#### Dependent Variables from experiment 2

Dependent Variables Experiment 1	evaluation of increased confidence	evaluation of improved reading	evaluation of improved write/spell
Diff. between read age 2 & expected read age 2	Correlation Co. 0.132 Sig. 0.683	Correlation Co. -0.016 Sig. 0.961	
Diff. between spell age 2 & expected spell age 2	Correlation Co. 0.316 Sin. 0.318		Correlation Co. 0.231 Sig. 0.469

**Hypothesis 7:** There will exists a significant correlation between evaluation scores of TTRS's effectiveness at increasing self-confidence and the difference between expected reading and spelling ages at time 2 and actual reading and spelling ages at time 2. Hypothesis 7 was not supported, hence the children who had shown the greatest improvements in reading and spelling ages were not the same children who reported that they felt their self-confidence had increased the most as a result of using the TTRS program, (refer to table 4).

**Hypothesis 8:** There will be a significant correlation between children's evaluation scores of TTRS's effectiveness at improving reading skills and their actual improvements made in reading age as a result of using the TTRS program. Again hypothesis 8 was not supported, so the children who made the greatest improvements in reading age over the experimental period were not the same children who perceived their improvements in reading skills to be the greatest, (refer to table 4).

**Hypothesis 9:** There will be a significant correlation between evaluation scores of TTRS's effectiveness at improving writing and spelling skills and actual improvements made in spelling age. Jet again no correlation was found, indicating that the children who made the greatest improvements in spelling age over the experimental period were not the same children who perceived their improvements in writing and spelling skills to be the greatest, (refer to table 4).

## DISCUSSION

### Summary of results

The results of the present study found a significant increase in the reading and spelling ages of the children, which was above what one would expect due to maturation over a period of 4 months. No significant difference was found between the Saturday club group and the Southmead School group in their improvements made in reading and spelling ages. The analysis of the self-report questionnaire revealed an overall positive evaluation of the TTRS program by the children. Results of an ANOVA test revealed a significant group difference between the children from the Saturday club and the children from Southmead School in their evaluation of the effectiveness of the TTRS program, with the Saturday club children evaluation the program more positively. No correlation was found between the children's actual improvements in reading and spelling ages and their perceived improvements in reading and spelling ages, from the questionnaire results.

### Improvements in reading & spelling ages

It was hypothesised that there would be significant improvements made, in the reading and spelling ages of the children, having been exposed to the TTRS program, with the rate of improvement being greater than expected without the use of an intervention program. The descriptive statistics and the results of the ANOVA tests supported this hypothesis. The children achieved average improvements of 4.33 months for reading age and 4.28 months for spelling age, above what would have been expected simply due to maturation during the 4 month experimental period.

The results from the study seem to support the claims made by Philip Alexandre (the maker of the TTRS program) that using the TTRS computer course will help to develop the literacy skills of those who have difficulties with reading, writing and spelling. When initial observations on the TTRS course were carried out by Vanessa Charter (1998) she too observed a positive learning environment. Other studies evaluation the effectiveness of various



remediation programs for dyslexics have found similar levels of improvement. The study by Fawcett et al (1993) which evaluated the effectiveness of two computer-based spelling remediation programs which used a multimedia presentation approach, found both programs to be effective at increasing spelling ages. Elkind et al (1993) investigated the effectiveness of using computer-based readers to improve reading comprehension of dyslexic students, this multi-sensory reading aid was also found to be effective at improving reading comprehension. This evidence seems to suggest that specific computer programs can offer a lot to a dyslexic child and that such programs may well be the way forward, for the future of dyslexics.

Another factor which appears to play an important role in the effectiveness of such computer aided learning programs such as the TTRS program is its multi-sensory nature. Lowenstein (1997) evaluated the effectiveness of a program to improve the reading ages of dyslexic children which did not use computers but used a multi-sensory technique, again reading ages improved significantly over a year. Pioneering figures in the field of developing teaching methods for dyslexics were Orton and Gillingham, Samuel T. Orton was a neurobiologist who's writings dealt with neurobiological concepts and theories surrounding dyslexia, which were used to develop methods of teaching dyslexics. Gillingham took Ortons neurological hypothesis and conformed them to develop teaching programs for dyslexics, the technique they developed "....is based upon the constant use of associations of all the following: how a letter or word looks, how it sound and how the speech organs or the hand in writing feels when producing it" (Gillingham and Stillman 1956, p17). It was such pioneering figures that first demonstrated the importance of a multi-sensory approach in the teaching of dyslexics, (for further information on the Orton Legacy see Henry, 1998).

### **Group differences in improvements in reading & spelling ages**

It was predicted there would be a significant group difference, between the children from the Saturday club and the children from Southmead School in the improvements made in reading and spelling ages. However the descriptive statistics revealed no significant group difference, and the results of the ANOVA test also found no group difference in improvements made in reading or spelling ages, hence hypothesis 2 was not supported. These results suggest that



both the Saturday club children and Southmead School children experienced similar gains in reading and spelling ability by being exposed to the TTRS computer aided learning program

It was predicted that there would be a difference, as the Saturday club children used the program voluntarily whilst the Southmead School children used the program as part of compulsory special needs help at school. Consequently it was predicted that the Southmead School children would be less motivated towards using the TTRS program, and therefore were expected to experience smaller benefits from using the TTRS program than the Saturday club children, however this was not the case. This result seems to propose two possible explanations, either both groups were equally motivated towards using the TTRS program, or motivation has little influence on learning, when using the TTRS computer aided learning program.

Hypothesis 3, examined if there existed a correlation between the improvement made in reading age with the improvement made in spelling age, it was predicted that a correlation would exist. The results of the Spearman's Rank correlation gave a Correlation coefficient of 0.589 which was significant at the 0.05 level of significance, therefore accepting experimental hypothesis 3. This result confirmed the idea that the children who improved the most in reading age were the same children who improved the most in spelling age. This suggests that although most children showed improvements in reading and spelling ability, having used the TTRS program, some children benefited more from using the TTRS computer aided learning program than others.

Although no group difference was found, large individual differences were observed, with most participants having a second reading and spelling age between 2-4 months above expected, whilst 25% of the participants had second reading and spelling ages between 7-14 months above expected. Despite these large improvements, in the Saturday club group there was one child who did not improve his reading age, and in the Southmead School group there was one child who failed to improve her spelling age. A possible explanation as to why some children excel using different learning programs, whilst others do not seem to experience the same benefits was given by Elkind et al (1993).

Elkind et al (1993) examined the effectiveness of computer-based readers to increase reading comprehension of dyslexic children, they found the computer-based reader to be an effective method of improving reading comprehension, however large differences were observed in its effectiveness with different children. In this study participants all had a diagnostic profile of auditory strength, visual strength and kinaesthetic strength, this profile was correlated with comprehension improvement. No significant group correlation was found, but when Elkind et al. looked at the extremes of the distribution of the change in standard scores, a hint of two interesting relationships were found. First, the three students who had the largest gains in comprehension had auditory strengths and visual weakness. Second, the two students whose comprehension scores declined the most when using Bookwise had kinesthetic-motor weakness (Elkind, Cohen & Murray, 1993).

The TTRS program has different forms of presentation e.g. following the dictation from the computer screen, having the dictation read out by the teacher/assistant, or finally headphones can be used to listen to the dictation (called the Touch-Type Hear and Spell program). When carrying out the experiment the experimenter got the impression that the most commonly used form was reading the dictation from the screen, and very rarely used were the headphones. Both groups told the experimenter they had experienced great difficulty in getting the headphones to work, which appears to be due to a design fault, hence they were rarely used. When considering Elkind et al (1993) explanation for the large individual differences it may be firstly be worth considering that the participants who experienced minimal improvement could possibly have auditory strengths, and sound was not used as often as it should have been. Secondly the participants who experienced the greatest gains may have been those with visual strengths. This would make for interesting work when evaluating such multi-sensory programs of dyslexic children in the future.

Another explanation which could explain the large individual differences observed could simply be the nature of the participants. Not only were the participants varying in I.Q and the severity of their learning disability, but dyslexics are a heterogeneous population, with a varied range of symptoms and difficulties. As Snowling (1985) pointed out one of the major problems in identifying dyslexia and helping children with dyslexia is that dyslexic children do not all show a standard group of weaknesses. When one tacks the diversity of dyslexia into

account, one realises that we should not expect a single remediation program be equally effective for all dyslexics.

### Questionnaire results

This study was relatively unique in that not only did it evaluate the effectiveness of the TTRS program by measuring improvement in spelling and reading ages, but also the children who took part in the experiment were asked to evaluate the TTRS program by completing a questionnaire. The children's opinion of the different features of the TTRS program and its effectiveness at having increased their reading skills, writing skill, confidence and motivation were thought to be important variables, as they were the ones using the program.

Hypothesis 4, predicted that the TTRS computer program would receive a positive evaluation from the children. The descriptive statistics illustrated that all of the average evaluation scores of the five different components (TTRS's ability to: improve reading skills, improve spelling skills, increase self-confidence, increase motivation and the different features of the TTRS program) of the TTRS evaluation questionnaire were above the half way score, which was the cut off point for a positive evaluation. These results support experimental hypothesis 4, hence children felt that using the TTRS program had improved their reading and writing skills and helped to increase their self-confidence and motivation towards academic work. The results of the questionnaire also suggest that the children liked the structure, features and presentation of the TTRS program used.

The children's perceived increase in reading skills, writing skills and academic self-confidence in this present study coincide with the results of Westervelt et al. (1998) study. Westervelt et al. (1998) look at children's changes in self-concept and academic skills during a multimodal summer camp program. The study found that the campers improved significantly in phonetic reading and spelling skills, and also exhibited significant improvements in self-concept, both on a general level and in the specific areas of reading and overall academic competence (Westervelt et al., 1998). The children in Westervelt et al. (1998) study entered the camp with an average reading self-concept score that was well below the norm, and were generally below the norm regarding their overall confidence to perform in school. At the end of the summer camp significant gains had been made on the "total self" score which confirmed that the camp



experience had a positive impact on the overall self-concept of the children, a simple repeated measures ANOVA indicated that there was a significant increase in total self-concept score, which was significant at a 0.002 level of significance (Westervelt et al., 1998). These findings confirm that dyslexic children can experience a noticeable change in academic skills and self-concept, in a relatively short period of time if suitable interventions are introduced.

Hypothesis 5, predicted that there would be a significant difference between the Saturday club children's evaluation of the TTRS program and the Southmead School children's evaluation of the TTRS program, as the Saturday club children used the TTRS program voluntarily whilst the Southmead School children's use of the TTRS program was compulsory. The descriptive statistics illustrated that each average evaluation score given by the Saturday club children was higher than each average evaluation scores given by the Southmead School children. The results of the ANOVA also found a significant group difference in the evaluation score given for the TTRS program. Hence experimental hypothesis 5 was excepted. This suggests that although both groups improved their reading and spelling skills equally by using the TTRS program, the Saturday club children had a more positive opinion of the TTRS program, which is thought to be due to the fact that their use if the program was voluntary, and hence they may have been more highly motivated towards using the TTRS program.

As well as the general group difference the largest group difference observed was the two groups evaluation of the features of the program, with Saturday club children giving a very high evaluation of 90% compared with the Southmead School children's evaluation which was 59%. A possible explanation for the fact that largest group difference occurred in their opinions of the features of the TTRS program, could be that this group of questions did not ask the children about their perceived own improvements such as reading skills, but just about the features of the program, hence they were solely evaluating the program and not themselves. Children with specific learning disabilities have been shown to experience a lack of confidence in approaching academic tasks (Harter, 1990), therefore many of the children may have found it hard to say that they feel their spelling for example had improved a lot. However when evaluating the different features of the TTRS program, the children were not likely to have experienced these difficulties. The Saturday club children's high evaluation of the features of the program is not surprising when one takes into account, that these children gave



up their Saturday mornings to use the TTRS program, which suggests they were highly motivated towards using the TTRS program, which was reflected in their evaluation scores..

It was predicted that evaluation scores given by children on one aspect of the TTRS evaluation questionnaire e.g. it's effectiveness at having increased their level self-confidence, would correlated with other evaluation scores they had given for one of the other five components of the questionnaire, e.g. it's effectiveness at having improved their reading skills. To test this Spearmans Rank correlation's were performed. Three correlation's were performed and each gave a significant correlation at the 0.05 level of significance. There was a positive correlation between TTRS's ability to a) increase confidence and increase motivation, b) increase confidence and improve spelling skills and c) increase confidence and improve writing and spelling skills. These results demonstrate that those participants who felt using the TTRS program had improved their reading, writing and spelling skills the most were also those who felt using the program had increased their confidence and motivation the most, thus experimental hypothesis 8, 9 & 10 were accepted.

### **Correlation's between reading & spelling ages with questionnaire results**

Four Spearman's rank correlation's were performed to determine if the children's improvements made in reading and spelling ages correlated with the questionnaire results of their perceived improvements. The actual improvements in reading and spelling ages were correlated with the evaluation scores from the questionnaire on perceived improvement in reading skills, writing/spelling skills, levels of academic self-confidence and academic motivation. No significant correlation's were found, thus experimental hypothesis 7, 8 & 9 were rejected and the null hypothesis excepted. From these results one can conclude that the participants who improved the most in their reading and spelling ages were not the participants who felt they had improved the most in their reading and writing/spelling skills having using the TTRS program. Also the participants who felt their level of self-confidence had improved greatly due to using the TTRS program were not the same participants who had made the greatest improvements in their reading and spelling ages.

This lack of correlation between the children's improvements made in reading and spelling ages and their scores from the evaluation questionnaire, could be due to a number of reasons: e.g. children would have varied in the criteria they used when answering the questionnaire. Some of the children may not have been aware that their reading and writing skills had improved. Such factors as the child's level of self-confidence could have influenced the way they selected their response on the questionnaire. Another possible explanation is that the children who experienced the grates improvement in reading and spelling ages may be more use to achieving in general and hence felt that the gains they had made, were not as significant as the children who rarely achieve, but noticed an improvement in reading and spelling skills when using the TTRS program.

### **Limitations of the Study**

The major limitations of the study were its quasi-experimental pre-test post-test design, and the lack of a control group. The experimenter was not able to find a matching control group for the study as all the children attending the Saturday club used the TTRS program and any differences found between the Saturday club children and another group of dyslexic children could have been attributer to the fact that they attended a Saturday club. Ideally all the children attending the Saturday club should have been randomly allocated to either an experimental or control group, but this was not possible for two reasons: (i) there were not enough children attending the Saturday club and (ii) the parents of the children would not have accepted half of the children being deprived of using the TTRS program of the purpose of this study. A similar situation was encountered at Southmead School as all the children with reading and writing difficulties were using the TTRS program, hence a comparable sample was not available within the school.

The small number of participants was another draw back of the study, however it was not an easy task to find participants for the study, as the experimenter was not aware of any other groups of dyslexic children with aces to the TTRS computer aided learning program, that were within an accessible distance. The small number of participants and the lack of a control group meant that any significant results found have to be excepted with caution, however the fact that both groups improvement in reading and spelling ages were similar to each other and

previous studies using multi-sensory remediation programs can make one more certain of the results. Time was also limited in this study, if a longer time period had been available a time series design could have been used, to strengthen the design of the study, and increase its reliability and validity. It would also have been beneficial, if the experimental period could have been longer as child's academic progress does not occur in a uniform fashion.

Sufficient controls were not used when selecting the participants e.g. the experimenter had no knowledge of the participants I.Q levels or the extent of their learning disabilities, however this was unavoidable due to the shortage of possible participants to take part in the study. Not all the participants were stated as being dyslexic, however they all experienced reading and writing difficulties and most were thought to be dyslexic by their teachers. When testing the participants of their first reading and spelling ages most had a reading and spelling age of about two years below their chronological age, which suggests that they are dyslexic. It was not essential to the study that all the participants were stated as being dyslexic however it would have added an extra control which would have been beneficial to the results.

### Modifications

Ideally a larger sample of participants should be used with a matched control group, in order to do this one would need a large sample of dyslexics, so that one could have an experimental and control group with as few constraining variables as possible. Two possible designs that could be used are either (i) a time series designs, in order to monitor the participants normal increase in reading and spelling age over a time period before introducing the TTRS program, or (ii) having half the participants use the TTRS program for the first half of the experimental period whilst the other half would act as the control group, then the two groups would swap round and the control group would then become the experimental group. The advantage of such designs are that it enables the experimenter to monitor the progress of the participants when they are not using the TTRS program and then compare it to when they are using the TTRS program.

## **Future Research**

It would be interesting to look into why some children experience great benefits from using such programs as the TTRS program whilst others only experienced marginal benefits. An interesting way to approach this question would be to investigate Elkind et al (1993) suggestion that such differences may be related to the participants auditory, visual and kinaesthetic strengths and weaknesses. It would also be of interest to find out as much other information about the participants, which could influence their computability with different remediation programs e.g. memory weaknesses.

## **Conclusion**

In this experiment set out to evaluate the Touch-type Read and spell computer aided learning program by Philip Alexandre. This was done by gaining a reading and spelling age of 12 dyslexic children aged between 8 & 12 before they started to use the program and again after they had been using it for about 4 months. The participants also evaluated the program by answering a questionnaire which assessed their attitudes towards the program and how effective they felt it was at improving their reading, spelling, confidence and motivation. It was found that exposing the children to the TTRS program for a period of 4 months improved their reading and spelling ages significantly, this improvement was significantly larger than the rate of improvement one would expect for a dyslexic child simply due to maturation. The TTRS program received an overall positive evaluation from the children involved in the study. It was great to find significant results however with such a small sample one must be careful in drawing too many conclusions.

These results highlight the importance of such specialised remediation program for children with dyslexia, not only has the TTRS program appeared to significantly improve reading and spelling skills but it appears to have increased the children's level of self-confidence and motivation. Many dyslexic children can experience great frustration due to their disability this can lead to a lack of confidence and motivation, which may eventually result in the child ceasing to try in school. Surely if such a program as the TTRS can provide help for children with learning disabilities, schools should make every effort to make them available.



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