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Identifying and Remediating Dyslexia in Kindergarten and the Foundation Year

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Abstract

Dyslexia is a learning disability found across the ability range. It is an unexpected failure to learn to read and spell despite conventional classroom instruction. It is usually identified at about 7 years of age or beyond when the dyslexic fails to learn to read. The incidence varies in different countries in different languages and with teaching methods. This research presents a new method for the identification of dyslexia by the Reception or Kindergarten teacher as part of everyday teaching. The method uses a child's freeform writing and a checklist that identifies a critical borderline point that must be reached if the child is to become literate. In order to overcome any difficulty, a specific intervention was identified and a training technique was introduced in a Reception Year cohort (N = 175 children). It was based upon previous research that found dyslexia was caused by a unique deficit that prevented them from developing early phonological awareness in the normal course of learning. The intervention strategy also enabled disadvantaged learners to catch up with more advantaged peers and close the 11-month learning gap found in the national statistics. Their Key stage 1 school SATs showed 30% uplift 3 years later.

Keywords: dyslexia, disadvantage, kindergarten, reception year, intervention, remediation

1. Introduction

Dyslexia is an unexpected difficulty in learning to read and spell in relation to age and ability by the methods normally used in classrooms. In the modern era it has become a serious problem for large numbers of people as education has extended and demanded they become literate. Dyslexia is sometimes accompanied by and made worse by handwriting difficulties (dysgraphia), and whilst most dyslexics do eventually learn to read when given specialist tuition as adults, they still have residual spelling problems.

Because English is an opaque not a transparent language system, there are larger numbers of dyslexics in countries where English is the home language. Transparent languages such as Italian, Turkish and Spanish have a one-to-one correspondence between the sounds of the language (phonemes) and its written symbols (graphemes), and they are said to be 'regular' in this respect. English on the other hand has only a 40% phonemic regularity, and the rest is derived from its history with other languages mainly Norse, Anglo-Saxon, Greek, Latin and Norman French.

To accommodate this knowledge, 15 basic words and the rules that govern them can reveal how to spell 20,000 English words correctly [1]. But it is first of all an understanding of the alphabetic principle and how it is used that is crucial. It is this, with which Reception and Kindergarten learners have to cope.

Arabic, a Semitic language, with 33 phonemes is also a transparent language [2] and has been widely adapted to various other languages such as Urdu, Farsi and Kurdish. It was the Phoenicians in their Semitic language who were thought to have invented the alphabetic system to facilitate and record their trading negotiations [3]. This alphabetic principle is thought to have been invented just once about 2700 years ago and could probably only have occurred in the Semitic language because it was consonantal and did not have vowels; they were imported later by the Greeks. As will be explained it is unlikely that a dyslexic could have invented it.

The incidence of dyslexia in the UK, according to the British Dyslexia Association [4], is 10% of which 4% are severe cases. In some disadvantaged groups, the incidence can be as large as 19% [5]. It was also found that there were hidden populations of dyslexics who had learned to read but still had severe spelling problems especially with new and technical vocabulary. These amounted to one-third of cohorts in the disadvantaged areas. The result is that the poor spellers and writers underachieve at school and then at university. Their talents may lie hidden for many years. There is also a group that has learned to read often self-taught but have dyslexic spelling problems, and this has been termed 'dysorthographia'. Research and practice with this range of dyslexics over four decades formed the basis for the present studies.

2. Background theory and research

The research of Chall [6, 7] demonstrated that if teachers initially employed a purely visual system of reading teaching (paired associate memorising) called 'Look and Say', 4% of the learners became dyslexic. If however they were taught from the outset by a purely phonic system, the dyslexia rate was about 1–1.5% ([8]; SED (Scottish Education Department) The Education of Pupils with Learning Difficulties in Primary and Secondary Schools. A progress Report by HMI Edinburgh: HMSO 1978; [9, 10]). Over time UK Governments' encouragement to use 'mixed methods' and then 'Phonics First' [11] have met with limited success.

Over the same period research into the psychological processes involved in becoming literate, and literacy teaching have followed a similar path. The emphasis is placed on learning to read, and reading development has dominated both practice and research, whilst spelling was marginalised until recently. There have however been threads that can be traced showing that spelling is more important to learning to read than has previously been considered by many researchers and would repay more detailed investigation.

For example, although dyslexia research on a vast scale has centred upon the reading difficulties, both Chomsky [12] and Clay [13] found that children's first impulse was to write not read. When asked to write a message or story, the children picked up a pen and made 'marks on paper' and 'read' it back. When asked to read a storybook, they said they could not do so because they had not yet been taught to. It was when marks on paper such as these began to be studied that a range of levels of marks were observed. These went from scribbles and lines to letters and words carrying a decipherable message although not quite with traditional spelling. Occasionally there were cases of 5-year-olds entering school or Kindergarten who had learned to read and write self-taught, and they were not necessarily those with the highest of IQs [14].

'My little sister is in bed because she is having her tonsils out.'

Examples such as the writing of Faye above were collected after she had spent 1 month in the Reception class. The teachers said the children could not read or write free-form; although some could copy write, none could read as they had only just begun to teach them. The teachers were astonished at what some of the children already knew about writing. The error patterns may give a significant profile of a child's knowledge about the alphabetic system that has been picked up incidentally in a word-filled world and classroom. Disadvantaged learners would be disadvantaged in this respect as their parents might not share books and reading with them or give them pens and pencils to hold and make drawings. Once in school they could be expected to catch up, but what about dyslexics?

Figure 2 shows a dyslexic's lack of sound-symbol knowledge after a year and a half in school. He uses letters from his name (before condition), but his message is not readable. He shows some knowledge of word structure and leaves spaces between his 'words'. He has not been systematically taught phonics. However after 6 x 20 minute lessons on the dyslexia programme Teaching Reading Through Spelling (TRTS) [15], his new message is readable.

I went to my nannys and I went hma anB hta my pna anB I sat up Lt anB Wto tave'.

I went to my nanny's and I went home and had my dinner and I sat up late and watched TV'.

He has 'cracked the alphabetic code' although as yet he does not know all the sounds and their symbols. Some whole words from daily copy writing are now 'patched in'. The school did not permit joined up writing until the children were in Year 3! The rest of the pupils in Steven's class had learned to read and write to varying degrees, and even he had had extra individual reading coaching sessions, but after all this he had made no progress. Fortunately for him his teacher wanted to try the TRTS system, and after six sessions he had made significant progress at last—he had 'cracked the alphabetic code'.

The success of the TRTS sessions was because it used a multisensory-articulatory-phonological-training (MAPT) system, whereas traditional phonics systems use just multisensory phonics training, that is they combine writing the grapheme with saying its sound. MAPT focuses the attention on the 'feel' of the phoneme in the mouth as it is said and written. This means that the phoneme and grapheme that are regarded as abstract perceptual units [16] are linked by a concrete articulatory cue. These are most clear for the consonants, the vowels are more open mouthed with different placing, and it is noticeable that in the literacy acquisition phase, beginners identify and mainly write the consonants. As they progress they map more correct spelling versions onto this structure [17], and this can be seen in both the **Figures 1** and **2** examples above. As beginners try to spell, they can often be seen mouthing the words as they do so presumably to recall the links. As early as 1932, Monroe [18] had pointed out the importance for early readers and writers of articulating, subvocalising and mouthing the sounds of the letters.

The reason for introducing an articulation awareness (AA) training element was derived from earlier research in which it was found that in cohorts of dyslexics going through a specialist remedial teaching centre, an AA deficit was evident. When this was put to an experimental test, the following results were obtained:

Table 1 shows that spelling age matched controls and dyslexics performed well on phoneme segmentation tasks but differed significantly ($p < 0.01$) on articulation awareness test items. Dyslexics on the waiting list to enter the remedial centre who were age matched as near as possible performed significantly poorly on both PS and AA tests [1, 19, 20].

my is bk hafi oot
in bed
HETI sid
se is
HI to SLS

Figure 1.
Faye: 5 years 1 month.

Steven Before
Nlishr
Nlississ
nis
ni
nl

After
Monday 2nd APRIL
I Went to my nANNYS
and I went hma
and hta my pNa
and I Sat UP Lt
and Wtu tae

Figure 2.
Steven' writing aged 6.5 years in the 'Look and Say' era.

Dyslexia is currently regarded in the majority of cases as a verbal processing difficulty with particular problems in the area of phonological processing [21–24]. It is the problem that at least 90 per cent of dyslexics appear to present. On the basis of the research in **Table 1**, it was hypothesised that the phonological processing deficits might be caused by an underlying articulation awareness problem that prevented or delayed the learning of symbol-sound associations especially during implicit learning processes. It would mean that attention to a four-way system of VAKs principles should be followed rather than the three-way multisensory system used by most remedial teachers that omitted the kinaesthetic aspects of speech (**Figure 3**).

Reading and spelling development in dyslexics was analysed by Frith [25] as a process moving through three stages from logographic, to alphabetic and to orthographic based on the errors they made. She divided each stage into two further steps in which sometimes reading and sometimes spelling were the pacemakers. She explained that dyslexic children typically have difficulties moving from an early phase of acquisition in which reading is visually based (logographic) on the alphabetic phase when children are able to use letter-sound associations for both reading and spelling. This can be seen in the writing of Steven in **Figure 2**. In the ‘before’ condition, he can be seen to be stuck in the orthographic phase. With the specific MAPT training technique used in the early part of the TRTS programme, he makes the articulatory connections and can begin to use them to generate new words and enters the alphabetic phase. His developing skills in this respect can be seen in the second piece of writing after he writes some well-practised words.

At a later stage, some dyslexics fail to move from the alphabetic phase to the orthographic phase where reading and spelling were thought by Frith to be automatic and considered to be independent of sound. This condition is seen in many

	Nos	Reading Age	Spelling Age	PS (15)	Artic Aw (10)	IQ	Chron Age
Controls	84	8.61	8.02	11.94	7.75	110.03	7.94
Dyslexics on TRTS	114	7.95	7.62	10.27	4.31	110.43	12.90
Dyslexics waiting	30	6.71	6.0	4.13	5.87	112.67	8.97

Key: PS, phoneme segmentation (sing minus ‘s’ gives ‘ing’, etc.). A 15-item test.
 AA, articulation awareness. Test of 10 items.

Table 1.
 Mean scores on phoneme segmentation (PS) and articulation awareness (AA).

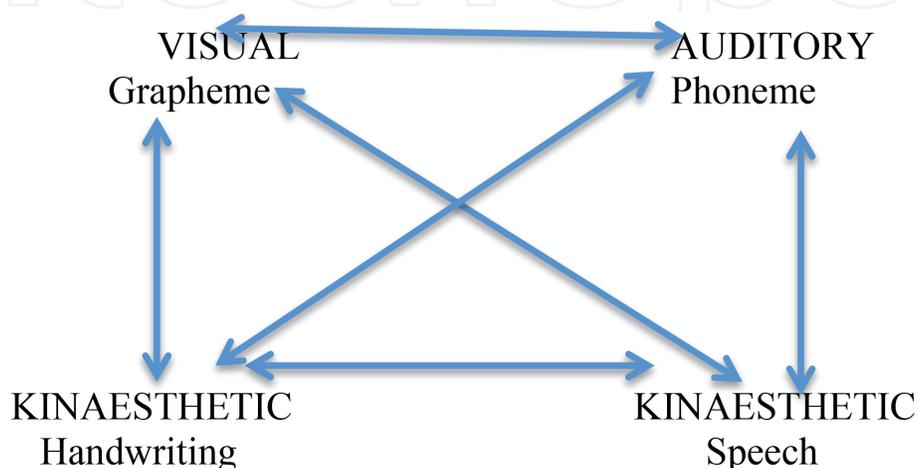


Figure 3.
 To show the four-way multisensory VAK links.

adult dyslexics. Traditionally dyslexia has been identified in the alphabetic phase after a long delayed start when they are at least 2 years below the literacy level of peers. This level is not consistent with their age and ability. Various forms of intervention 'in class' then 'one-to-one additional support' may have been given and still have failed to bring them at least up to grade level. They are three-time failures by this time and often confused and upset. Even then an official diagnosis and funding support for specialist tuition might only be obtained just before entry to secondary school. Even so the remedial provision may not be adequate so although the dyslexic may begin to develop phonological awareness and start reading, he or she may never catch up with peers. To catch up means that they must make a 2-year literacy progress in each year of the specialist programme [23]. A meta-analysis of programme outcomes showing which are successful may be found in Montgomery [5, 26].

When dyslexia is identified in the early school years, remedial teachers report that it is easier to remediate. An extensive survey of 10,000 cases by Goldberg and Shiffman [27] had established this although they found that residual spelling errors remained.

Thus far a system to identify and remediate dyslexia in the early years by targeting sound-symbol correspondence development in the Logographic phase had not been developed. The Logographic phase is the literacy acquisition stage, the task of the Reception (Foundation Year) or Kindergarten learner. Sound-symbol correspondence is important for decoding unknown words during reading and for encoding for spelling, and this is why there was an emphasis in the United Kingdom on 'Phonics first' [11] and in the Early Years Foundation Stage guidelines [28] in the presence of a 'Look and Say' ethos.

This research however was pointing to a new direction for dyslexia investigation and remediation, and this was the role and meaning of children's early marks on paper in the logographic phase.

3. The research on early marks on paper

Normal spellers according to Gentry [29] also go through a logographic phase, but he found that there are two steps in it. The first step was pre-communicative in which marks and scribble were made as children 'wrote' their stories. This was followed by a prephonetic step in which there were invented or creative spellings in which a single letter or 'phone' or several letters might represent a word. Surprisingly research with dyslexics by Liberman [30], Bryant and Bradley [31] and Bourassa and Treiman [32] found the same characteristics, but there was a failure to move into the prephonetic stage. This was detectable not in their reading but in their attempts to write [1, 10]. Once the literacy journey had begun although several years later the reading and spelling errors of the dyslexics did not differ significantly from those of normal writers [19, 32].

In literacy learning, we have a situation in which normal readers and spellers learn sound-symbol correspondence implicitly or when specifically taught in Reception and some even arrive with that knowledge, and dyslexics who do not. Surely their problem must be detectable at an early stage as they fail to move into the prephonetic stage? This was the basic research question.

Previous research had found such a system was necessary for dyslexics because they appeared to have an articulation awareness deficit [1, 19]. This was potentially an observable sign of the neurological problem found in the 'pick up' systems by James and Engelhardt [33]. Their research showed during fMRI scanning that when preliterate 5-year-olds traced, printed or typed letters and shapes and then were shown images of these stimuli, a previously discovered 'reading circuit' in the brain

was activated during letter perception. However this only occurred after handwriting not after tracing or copying that are frequently used in early years education. Their conclusion was that handwriting supported symbol-sound knowledge development in normal subjects. It was a connection made implicitly during contact with print. It suggests that it is a process that occurs normally during literacy teaching by 'Look and Say' methods and can be facilitated by systematic phonics systems leading to lower incidences of dyslexia. It is also the reason why multisensory phonogram training has been incorporated into the more successful remediation regimes. In dyslexics there appears to be a disruption in the neurological system so that very specific and often repetitive training is needed initially to overcome the 'phone' barrier. After this has been done, the whole process speeds up.

Geschwind [34] identified dissociation in dyslexia in the left angular gyrus. This is where sounds and symbols would be connected (by articulatory feel/movements), but in dyslexics this connection appears to be broken. It therefore needs to be restored by overtraining, or other areas of the brain have to be taught to take over the 'pickup' function. This is most possible in the youngest brains. Using in-air tracing of the letters then writing them free-form on the paper, the Fernald [35] method, and using MAPT and cursive or joined writing, based upon practices in the specialist dyslexia, alphabetic-phonetic-syllabic-linguistic (APSL) programmes were part of the intervention system.

In 2012 four primary schools were recruited to take part in a pilot project. Each school had one to three Foundation (Reception year) classes, eight classes in all (N = 175). The children were just 5 years old and a few were 'rising fives'. Their eight teachers were asked to collect one piece of copy writing and one piece of completely unaided (free-form) writing after the children had been 1 month in the school. The month was to allow them to settle into the school routines. The two writing samples were to be written on separate days using the materials they were now used to using in their class. For example, most would be telling their 'news' and then copy writing it. Some teachers would give them lines to write on, others would not and all the subjects would be using pencils. The free-form writing would be less common, and so the teachers' learning managers were the intermediaries who would ensure the rules were kept.

The teachers were told they would receive a report on the progress of each child from the marks they had made on the two pieces of work and also what might be done to help them progress. The first results were collected in October, and a second set of free-form writing was collected in March 2013 in the following year to check on any progress that had been made by the children. The reports were sent to schools in January and late May (2013). Schools A and B were in the disadvantaged areas and schools C and D in the advantaged areas (**Table 2**).

As can be seen, the children in the advantaged areas entered school with better writing skills than those in the less advantaged areas. This is not an unexpected result. In research for the Sutton Trust, Jerrim [36] found that children from disadvantaged backgrounds by the end of the Reception year were 5 months behind peers in reading development. It was significant that once they fell behind, they remained behind and failed to catch up later, and they were already consigned to underachieve by 6 years old. The tendency has been for teachers to regard a lack of writing skills in these early years as non-problematic [37] because the children will 'catch up' given more time to mature and activities to develop the necessary skills. However the research indicates that this is most unlikely.

The free-form writing scores were marked on a 10-point rating scale for 'spelling'. The spelling scale was established by scrutinising all 175 scripts in the F1 cohort and placing them in a rank order from random marks and scribble through to more or less correct spelling. A similar process was used to develop a handwriting

Class	Nos.	Free writing 1	Free writing 2	Nos. 'at risk'
A1	17	2.33	7.12	3 + 2
A2	18	2.44	4.3	11+
B1	21	3.24	6.13	4 + 2
C1	28	6.11	6.76	0
C2	27	5.37	6.1	5 + 3
Totals	111	4.29	5.32	23 + 7
Borderline nos.: 23 = scored 4				
Private school, initial results (F1)				
D1	21	3.57		
D2	22	3.5		
D3	21	4.05		
Totals	64	3.71		
This school left the project before task F2				
Free writing F1 = October 2012 sample: N = 175 (2 absentees)				
Free writing F2 = March 2013				

Table 2.
Results from the pre- and post-test free-form writing task.

checklist, but clinical items were included [5, 14]. The strategy was to identify the statement that most typifies the writing sample and award that 'score' or rank. A 'score' of 5 was pivotal in that it identified those children who had just 'cracked the alphabetic code'. This is best seen in their attempts to make words using 'skeletal phonics or phones' such as 'wt' for 'went', 'ws' for 'was', 'goig' for 'going' and 'se' for 'she' or single letter sounds to represent a word 'w' for 'was'. Phonetics would be represented by 'kwiz' for 'quiz', 'buk' for 'book', 'apl', 'nite', 'marster', 'berd', 'butiful' and so on.

Correct spelling of common words such as 'I', 'the', 'and' and 'my' did not count as phonic achievement as they are so commonly used in copy writing they can often be recalled visually rather than phonetically. The reports focused upon the explicit teaching of sounds by first feeling the consonants in the mouth and mouthing them and feeling them as they wrote the grapheme—MAPT.

3.1 Ranks for free-form spelling

1. Random marks.
2. Scribble, marks in some order.
3. Marks, mandalas roundels, occasional letters, possibly in lines.
4. Some letter shapes and letters, in a line.
5. Letters, possible phones.
6. Word forms, letters, phone(s) evident (the critical achievement).
7. Some phonic skeletons, word bits and phones, some meaning.

8. Skeletal phonics, phonetics, some words, meaning apparent.
9. Some correct words, phonics, phonetics, meaning mostly clear.
10. More correct spelling, skeletal phonics, meaning clear.
11. Mainly correct spelling, legible, systematic word spaces.

In October 2012 Millie's script in **Figure 4** is firmly written but with some conventional letter forms, but there is no sign that she is using them as phones as yet. She is on the borderline for cracking the alphabetic code; some direct MAPT teaching of M in her name and 'i' and 't' should help her begin.

In October 2012 James's script on entry to Reception 'I took grandad to the lidrary' scores 9 for spelling. The spelling is almost correct, the meaning is clear, but word spaces are not well defined yet. In comparison with Millie's script, his shows some coordination difficulties. For example, the script is faint, there is variation in pressure and 'wobble and shake' on the letter strokes. The letter bodies vary in size, and some letters are 'drawn' rather made in monoline, e.g. 'g' and 'y'. He scored 7 on the Handwriting checklist.

In March 2013 Bethan's emergent writing scores 8:

'at esd tighm weeget cheoklurt'.

'At Easter time we get chocolate'. This is a very good phonetic and phonic representation of her message and some word spaces this time. Good skill development. However she is not forming some of her letters efficiently so will need some direct teaching of how to make, for example, 'a' 'd' 'g' 't' 'h' with one continuous line instead of two.

3.2 Interobserver reliability

Twenty spelling scripts were selected from the whole pack and were used as training items to teach a naïve assessor how to use the scale so that an interobserver reliability coefficient of the instrument could be calculated. After 30 minutes training using the spelling scale on the 20 illustrative scripts, the naïve assessor was given all 111 scripts from schools A, B and C to assign a rank out of 10. The coefficient of agreement with the experimenter was +0.81. It was +0.93 when a small number of differences of one scale point were exempted. When the experimenter remarked the scripts after a delay of 1 month, the coefficient of agreement between assessments was +0.98. This showed that the categories were stable, and later a sample of experienced Reception teachers at two conferences were able to use them effectively and found the scale useful.

Girls consistently outperformed boys in each of the schools and classrooms.

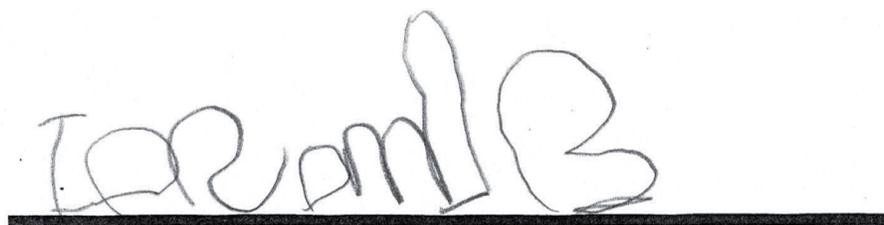


Figure 4.
Millie. I went to nanny's: Scores 4.

	Boys	Girls	N
A + B social housing	2.38	3.03	56
C owner occupier	4.52	6.81	55
D private school	3.34	4.06	64
	3.51	4.41	175

Table 3.
Initial socio-economic advantages in spelling scores.

The scores in **Table 3** show that school C children consistently obtained higher scores than the other two schools in the same local area and confirmed the disadvantages associated with being poor that were found for reading by Jerrim [36].

In **Table 3**, the ratio of ‘at risk’ boys to girls was 1.4–1 and not the standard 4–1 [4]. This was 27% of the cohort after 5 months in school that had not broken the ‘phone’ barrier. By the end of a further term in Reception, it would be likely that others would do this leaving about 20% at risk on entry to Year 1. The whole one third however would be unlikely to catch up with peers throughout their school careers according to Jerrim [36] in the Sutton Trust Research. These three schools were the feeder schools to a local state secondary school with a comprehensive entry.

In a Year 7 writing research project with this school [38], 18.6% of the cohort had spelling difficulties that put them in the ‘dyslexia zone’, and one third had poor spelling. This meant that they were failing the HMCI [39] criterion making more than 5 misspellings per 100 words. Although these researches were cross-sectional rather than longitudinal, the failing group sizes were remarkably similar, e.g. approximately 20% in the dyslexic zone and one third of the cohorts in the disadvantaged group at Reception and in Year 7. The dyslexic zone at the secondary school stage may seem large, but it included those who are often called ‘hidden’ dyslexics with spelling but not reading problems (dysorthographics).

4. Diagnostic and remediation interventions in the research

Data on ‘early marks’ on paper had been collected over a number of years on visits to Reception classes for teaching supervision, appraisal and reading research. As a result a pilot study in a London school was set up in 1997–1998. The school was in ‘special measures’ and requested appraisal help. It was found that the reading teaching method was entirely ‘Look and Say’ and the disadvantaged backgrounds from which the children came offered little literacy support. In order to redress the balance, a programme was written for them introducing MAPT, and a teaching progression developed from the remedial TRTS [15] system. This was based on the Hickey Multisensory Language Programme [40] that was in itself an anglicised version of the Gillingham and Stillman [41] programme—the ‘Red Book’ edition.

This specialist programme would teach MAPT and word building from the outset and cursive writing. The programme was called *Developmental Spelling* [20]. The pilot study was carried out in the school, which was already teaching cursive writing. The school SATs results for 1997 and then 1998 after using the programme intervention gave the following results (**Table 4**).

The maths scores show the potential of the children and some good teaching, whereas the literacy scores show a need for some serious intervention. Although the MAPT programme was devoted to spelling and achieved approximately 30% uplift, it can also be seen to transfer to reading and give reading support with 10% uplift.

	1997	1998
Reading	46%	56%
Spelling	16%	44%
Writing	57%	58%
Maths	83%	85%

Table 4.
SATs results for the FLane school.

Remedial programmes that did not give sustained attention to spelling were found not to be able to give the 2-year uplift that was required [1, 26].

In the interim a series of government initiatives took place such as the National Literacy Strategy (NLS, 1998) that failed and then Phonics First [11], which seemed not to have the impact that had been expected. As a result any independent research intervention in schools was not possible in that period except for some research projects by our MA students in independent schools. Their casework with dyslexics identified as falling behind in Reception even after the structured support found that they usually had both dysgraphia and dyslexia—more complex needs. In their cases daily individual tuition using the reading and spelling packs from Hickey MLC or TRTS for the first five letters brought the pupil up to the level of peers [42]. Other pupils with less severe difficulties were found to be able to move forward with the Developmental Spelling programme alone and their normal class reading teaching methods.

Free writing of news as in the above examples, sometimes called ‘free-form’, ‘emergent’ writing or ‘creative spelling’ [10] has the advantage over reading in that the evidence it provides is concrete and records the child’s developing knowledge. Although handwriting has been given little attention in English education in recent years [43], it also appears to play a more important role in reading development than has hitherto been understood as found in research with preliterate children by James and Engelhardt [33].

They found that the initial duplication process mattered a great deal. When children had drawn a letter freehand, they exhibited increased activity in three areas of the brain that were activated in adults when they read and write. These were the left fusiform gyrus, the inferior frontal gyrus and the posterior parietal cortex. It showed that handwriting supports sound-symbol knowledge development and provides another reason for using the MAPT training technique during the early learning of letters and their sounds. Solity [44] found that children only needed to learn a handful of sound-symbol associations to start them on their literacy learning. This is why it is essential to give them the training on /i/t/p/n/s/ because they can be used to build 25 words.

A writing component in dyslexia remediation is also endorsed by studies that showed spelling acquisition was greater when accompanied by writing activities as opposed to reading alone [45, 46]. Remediation programmes such as the Hickey Multisensory Language Course (HMLC) failed to give a 2-year uplift in each year when the spelling pack work and dictations were omitted [47]. In relation to later achievement, Berninger [48] found that the two best predictors of good composition in the later years were speed in writing the letters of the alphabet and coding them (writing the symbols for the letter sounds).

The present research had begun in 2012 when state schoolteachers seemed to become ready again to try new literacy initiatives. In this research having established the nature of the spelling/writing difficulties in the 175 scripts, a rank order of spelling skills was developed. Each script was analysed for the level of spelling skill in relation to the scale as well as handwriting competence. A scale point of 5 was

identified as critical in that it showed that the child had correctly just linked a sound with its symbol and used it in writing, and it was termed a 'phone' to distinguish it. It showed that a child had just begun to 'crack the alphabetic code' [49]. If this was the case, then profiles of dyslexic development showed that he or she was unlikely to become dyslexic. What was also found to be critical in dyslexics' progress was to build words, and this needed to be done from the outset of the programmes.

This new research offered an opportunity to test the effectiveness of the interventions using MAPT and word building with Reception (Foundation) Year and Year 1 children. In this cohort of over 100 children from a coastal area in England, it would be predicted that 10 of them would become dyslexic and at least 4 of them would have severe dyslexia and would not be able to write legible, readable messages by the time they were 7 years old, the traditional time when they might be identified. In this area it had been found that one third of their feeder secondary school pupils had significant difficulties with spelling and 18.6% were in the dyslexic category making more than 10 different errors per 100 words [38].

The eight teachers were sent a copy the *Developmental Spelling Handbook* as well as the reports on each of their pupils as for Hana and Freddie below. They contained a diagnosis of motor and spelling skill with suggestions on how the skills could be improved. The 111 reports were sent to the schools' learning managers in February 2013, late May 2013 and again in December 2014. The teachers could choose whether or not to implement any of the ideas, and some seemed more proactive than others in this respect especially the teacher of class A1. The results are shown in **Table 2**. The teachers in Year 1 could also choose to follow up on the programme based on the reports the results follow.

5. The follow-up study 2014

Two years later, in September 2014, the three State schools left in the project provided another sample of their pupil's writing on entry into Year 2. This time it was a 10-minute free writing 'test' on a favourite topic of the child's choice. They were given a few minutes to think and plan what they would write. Two schools A and C now responded (N = 93 pairs of scripts). There were 4 Year 2 classes altogether, 2 classes with 35 subjects from School A and 58 subjects from School C who had participated in the original Reception year study. The hypothesis was that if the teachers had been influenced by the reports and implemented some of the suggestions, instead of there being 10 dyslexics per 100 subjects, there might be just 1 or 2 per 100 subjects. Example profiles of two typical sets of reports are shown below for Georgia and Freddie.

Georgia: October 2012 copy writing (5): Copies all the words, good-sized writing cannot fit it all in quite. Uses capital A's and reverses form of 'y's. Brofeo for 'brother' indicates use of a phone so may have more in her repertoire if this can be explored. May just have cracked the code although emergent writing does not show this. Has two of the letters in her name 'G' and 'A' and some letter-like forms.

Emergent writing (3): Makes letters 'e' and 'o' as letter shapes. Has not 'cracked the code' here yet. Suggests focus upon teaching the two easy letters and their sounds and names such as 'i' and 't' and shows how words can be built using them, adding 'e' and 'o' soon to help with writing her name.

Emergent writing b. March 2013 (9): 'I think it is kuld in spias'. The meaning is very clear. There are word spaces, and she is using whole word knowledge plus good phonic skills. This suggests she has a good visual memory as well as phonic ability. Good clear writing of a reasonable size, suggest encourage joining now.

October 2014 Year 2 free writing: Georgia wrote 112 words 11.2 w.p.m. above average for the year group and made 7 misspellings 6.25%. No coordination difficulties noted.

Freddie: October 2012 copy writing (1): Traces over the yellow letters with variation in pressure and some wobble. Nearly manages to copy ‘I went’, but it deteriorates to a very shaky and faint ‘w’ and an ‘e’ upside down followed by ‘t’ then ‘t’ in ‘to’ and ends there (I went to the hospital). Shows coordination difficulties, so will need strengthening, rhythm and pattern training to support the writing skill.

Emergent writing a (2): Makes one or two very large letters (F) and letter shapes in a line. Has not ‘cracked the code’ but did appear to understand the writing task.

March 2013 emergent writing b. (2–3): He makes some very large letter shapes (half a page long) that include ‘i’, ‘F’ and possibly ‘n’. The marks are shaky but clear and in a line showing some development of motor skill and writing knowledge. However coordination difficulties are still apparent, and he needs some direct teaching to help him develop some basic phonic knowledge beginning with ‘onsets’ in reading and ‘I spy’ games.

His message is ‘Daddy, granddad, Nana, mummy, Keith, Joshy, Benben, Leo – we all went on a holiday and took a picnic’. There is a sense of desperation here in that his message is long, coherent and interesting, but his writing skills do not match it. This mismatch makes him a candidate for dyslexia if he cannot ‘crack the code’ soon. Try articulatory phonics with onsets.

October 2014: Year 2: Wrote 52 words, 5.2 w.p.m., and made 14 misspellings—25.93%.

Coordination difficulties noted in (a) and (b). Writing speed is significantly below average for this age group. It should be seven to eight words per minute. Spelling is in the dyslexic range but mainly likely to be because of the delays caused by his coordination difficulties.

Ninety-three matched pairs of scripts were identified and analysed. The overall totals for the two schools on entry to Year 2 are as follows:

- Mean writing speed was 6.91 words per minute
- Mean spelling error rate was 12.9 per script

Mean writing speeds of students in schools were found to be 1 word more than their chronological age [5, 50]. The results in **Table 5** show that the disadvantaged groups were writing more slowly than the mean for their age group and the advantaged groups were writing faster. This is one more reason why the disadvantaged groups will be prone to underachieve in school and university [48].

To test the predictive value of the spelling scale, the scores were added together for F1 and F2 emergent writing and tested against the spelling error scores of the same pupils in Year 2, as well as their words per minute; the Spearman’s rho

	Nos.	w.p.m. Means	Sp errors Means	Sp err %
School A1	18	5.57	13.41	22.4%
School A2	17	5.66	14.34	25.7%
Totals	35	5.61	13.88	24.0%
School C1	33	7.93	14.61	18.26%
School C2	25	7.76	9.28	12.67%
Totals	58	7.86	12.31	15.47%

Table 5.
Writing speed and spelling results from year 2 (N = 93).

correlations were significant at the $p < 0.01$ level for free-form writing and spelling (+0.58) and (+0.51) accounting for 29 and 25% of the variance. The correlations between words per minute and early spelling skills were not significant except for Class C2 (+0.48). This suggested an approach to teaching writing that valued correct spelling over encouraging developmental spelling. Or it was possibly an idea held by the children that it was more important to get things right than to learn from error. This may well be a disadvantaging approach in years to come in problem solving contexts. It may also be a consequence of lower social status rearing techniques as well as teacher attitude.

At the end of Year 2, the schools taking part in the Writing Research Project were entered for the national SATs, and the results are shown in **Table 6**. In 2015 the 2014 SATs results from the three local schools were collected from the Government Website.

The percentages are of children reaching Level 2 at Key stage 1 in the three schools. The project children in all three schools showed significant improvements in their results compared with the three previous years. The literacy improvements in the low socio-economic status schools (SES) A and B were in the region of 30% and 10% in the already high scores of the advantaged school C. It suggests that the teachers in these schools had implemented some of the techniques and this had benefited the children through the end of the Reception year and into Year 1. SATs results of other schools in the area did not show significant uplifts such as these.

After 19 months the main factors affecting the cohort's achievements were residual coordination difficulties, legibility and orthographic spelling problems. The analysis of the scripts also revealed some factors about the current teaching methods in the schools. It showed that 'Phonics First' and synthetic phonics were not much in evidence. Guided letter formation and the use of lines to write on would be prominent in a list of advisory points as well as removing tracing and copying from the schools' agenda. Of all the scripts from the Year 2 classes, only one was the least decipherable and contained the most primitive spelling. It is typical of spelling seen in the scripts of older or recovering dyslexics entering the alphabetic phase.

In this cohort it was expected that at least 10% would show dyslexic spelling difficulties by the time they reached Year 3 and at least one would be a non-reader and writer like Steven in **Figure 2** above, but this has not proven to be the case, and it is proposed that it was the early attention to 'phones' and word building that helped prevent this. However there was one boy who had handwriting and spelling problems in the alphabetic dyslexic phase.

He wrote at a speed of 4.9 words per minute, which is significantly slower than for the Year 2 age group as a whole (e.g. 7–8 w.p.m.). The script was faint and variable in pressure indicating coordination difficulties. His spelling showed he had cracked the alphabetic code later than other pupils and was just beginning to use it to communicate his ideas. He needed systematic direct teaching of word building using the basic sounds i/t/p/n/s and following the rest of the Developmental Programme.

	2011	2012	2013	2014	2014		
					Reading	Writing	Maths
School A	35%	47%	48%	78%	85%	80%	66%
School B	37%	37%	50%	66%	76%	78%	46%
School C	77%	87%	88%	96%	95%	98%	96%

Table 6.
Key stage 1 SATs results for the three project schools.

I took granddad
to the library

Figure 5.
James. I took granddad to the library: Scores 9.

Sahana

Ido my hom
wuck aft Sool

Abi I had a Hello Kitty birthday cake

td alk

Jarry Red hen had some bread

rhe hed
hdsmdh

Devon I went to the cinema

|||||

Figure 6.
Examples of the range of skills on entry to reception.

Since these pilot studies were completed, funded research in other countries has emerged that supports the underlying principles. For example, Suggate et al. [51] tested 144 German preschoolers (kindergartners) age 6.1 years before reading instruction took place. They were tested on a wide range of cognitive and skills items including fine motor skills (FMS); graphomotor skill, a Greek letter copying task; and writing—they wrote their names and were read 7 letter names to write, and literacy was tested.

They found that the best predictor of decoding (reading) was the ability to copy letters. The study showed that children who could write not only could read better but that early reading went hand in hand with writing. In an earlier study [52], writing letters was shown to be more effective in literacy acquisition than pointing at letters, confirming that implicit transfer from reading to spelling is lower than from spelling to reading.

Ehri's [17] research showed that when there is a basic phonetic structure, children begin to map correct spellings onto this, and this can be seen happening in various scripts in **Figures 4–6**. It shows how important reading is to spelling and writing is to reading and that it is unwise to use only one teaching method especially in the early stages. The 'Phonics First' approach when teachers might try to teach all the sounds before they teach word building or rush pupils on over the phonics ground before they have broken the code is to disadvantage them. Equally delaying the use of Look and Say for reading can also be disadvantageous.

6. Conclusion

In this research how to identify dyslexia in young children a few weeks after their entry to school was shown. It involved discovering if they had understood and could use the alphabetic principle and then giving specific training to those who had not. Pilot studies had shown that this could be effective, and the results in this study confirmed this. Later school SATs showed that the schools in the disadvantaged areas had undergone an uplift of 30% in literacy over previous years as a result of the intervention. In literacy learning pupils will proceed at different rates and steps, and stages will become blurred. It makes research into literacy acquisition through the single lens of reading impossible for resolving the dyslexia problem. What cannot be ignored is the role of implicit learning in literacy [53, 54] and for teachers to take account of this when children arrive at school in order to build upon the knowledge. The free-form writing task enabled this to take place.

The design and use of a spelling rating scale enabled the targeting of teachers' attention to developing 'phones' for use by particular children in both reading and writing. The use of 'phones' or lack of 'phones' in the children's scripts enabled the teachers to intervene and promote them. The intervention strategy was MAPT to overcome any barrier that might be preventing some of the children from easily acquiring alphabetic knowledge. The strategy also identified the severe dyslexic who should have been put on a specialist programme, preferably in the last term in Reception.

The reason that this study is significant is that not only does it identify the literacy of dyslexic and disadvantaged children but that it shows an intervention that can help them overcome their problems. What needs to be investigated thereafter is that if freed from the deficit at an early stage, their literacy can develop normally as teens and adults.

What is now needed is funded research that can train teachers in the technique. This would involve a 2-hour training workshop and then the implementation

monitored and the children followed through the elementary school years to evaluate the system in a large replication study. It is expected that this could be extremely cost-effective in human and financial terms both in the short and long term and help overcome the most common learning disability—dyslexia.

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