7

The Contribution of Handwriting and Spelling Remediation to Overcoming Dyslexia

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1. Introduction

This research details results of casework, interviews, observations and case history analysis of over 1000 dyslexics and those in schools who have not been referred. Their skills have been compared with similar numbers of control subjects.

Subjects referred to English Dyslexia Centres tend to be those with the most severe problems. Normal provision has failed with them. Remedial help within class and as an additional support has also failed. In the English system the diagnosis of need for referral for specialist tuition thus comes late, often at the transfer age of 10/11 years when the pupil is about to leave primary and enter secondary school. The delay in diagnosis is due to the Statementing system needed to gain additional resources, the specialist tuition, and lack of agreed diagnostic indicators in the early years.

In the UK up to the age of 7 or 8 years additional support within school is given. If it has not worked then a formal diagnosis is sought and expertise from a specialist tutor is applied for. What this chapter will seek to show is that:

- Diagnosis of dyslexia does not need to be delayed for several years until the child is a three time failure but can take place in the Reception class by the class teacher with a small amount of training.
- Many of the so-called 'remedial' programmes are not effective but the few that are effective need to be implemented as soon as possible to obtain the best results.
- The focus on reading throughout dyslexia research and teaching practice is possibly a mistake.
- Dyslexia may not be 'cured' but can be overcome by the right sort of tuition in primary school.
- Dyslexia is not a disorder but caused by a deficit that results in an educational delay.
- If dyslexia is remediated there can be associated improved behavioural outcomes.

2. What casework shows that experiments may not

Experimental research requires that the researcher comes to cases with a hypothesis about the condition that is then tested and accepted or rejected. The hypothesis is based upon detailed research of the relevant literature but this can mean that it is defined by that

research and the prevailing paradigm or 'zeitgeist' (Snow, 1973). In case work the researcher observes the case behaviours and tries to identify patterns that might lead to a hypothesis. For example:

> James is a 6.5 year old with an IQ of 147 on the Wechsler Intelligence Scale for Children (WISC). He has failed to learn to read and does not know any of the sounds or names of the alphabet. He can read some familiar common words and appears to know some of his reading books off by heart.
>
> The school has given him extra phonics and some one-on-one tuition. Because his parents are informed about dyslexia and well-off they have had him tested privately and this has enabled him to be more rapidly referred to the specialist tuition centre. The school has supported this because James was becoming very disruptive.

What the researcher puzzles over in this case and others like it is how such a bright child who can discuss God and the universe in great detail and is an expert on prehistoric monsters can fail to learn the 26 names and / or sounds of the alphabet. He has also failed to learn the names of the days of the week and the months in order and confuses left and right. On WISC his digit span and Coding scores were typically low compared with his overall results.

We might infer from this data as many do, the popular conclusion that he has a short term or working memory problem or a sequencing and orientation deficit. It follows from this that the remedial programme would focus upon improving memory and sequencing skills. Unfortunately it would be found to have little effect (Vellutino, 1979) as the inference from fact to theory is not quite so straightforward. In addition, there is a further problem in that training on hypothesised sub skills such as working memory (McGhee, 2010) and visual sequencing does not necessarily transfer to the skills of reading (Smith and Marx, 1972). This is often because the assumed subskills are not correctly defined (Montgomery, 1997a).

Our example case, James shows that his long term memory is very good as indicated by his general knowledge of astronomy and dinosaurs. Vellutino (1987) demonstrated that dyslexics' performance on visual memory items might be good but as soon as they had to verbalise or name the items as in some digit span tests performance was significantly poorer. Koppitz (1977) had found similar results in her Aural – Visual - Digit Span (VADS) test. She also showed that as reading improved so did the performance on the digit span test. Montgomery (1997a) showed similar results. What we can conclude is that working memory, sequencing deficits and failure to learn symbol-sound-correspondence or alphabetic knowledge are associated problems in dyslexia but are not necessarily the cause of it. They could all arise from a deeper problem.

2.1 Case study patterns

The case reports of more than 1000 dyslexics were recorded and analysed for patterns.

Pattern 1: Developmental dyslexia – these cases had a severe difficulty in learning to **read and spell**. None of them had a severe reading difficulty without a severe spelling problem.

Pattern 2: Developmental dysorthographia - these had a severe difficulty in learning to **spell** in the absence of a similar difficulty with reading. Some of the pupils had learned to

read, self-taught at an early age or had an earlier reading difficulty that had cleared up. In these latter cases the residual signs were slow reading and difficulties in skimming and scanning text. All had poor writing and compositional skills. Very few had been referred for remedial help in school.

Pattern 3: Developmental dysgraphia– 30% of the sample had difficulties in the area of **handwriting** as a result of a motor coordination problem in the fine skills of penmanship. This was often in the absence of reading difficulties but appeared to have caused problems in spelling development through lack of writing practice.

Pattern 4: Developmental Coordination Difficulties (DCD - dyspraxia) – these had a difficulty with motor skills, even after a reasonable period of skill acquisition. Those with gross motor difficulties usually also had fine motor coordination difficulties especially with handwriting and problems with spelling.

Pattern 5: Specific Language Impairment (SLI) – these cases had a record of early speech therapy, late speech development, articulation difficulties or stuttering. Mild speech difficulties may go undetected well into school age and in their more subtle forms have also been implicated in dyslexia (Snowling and Stackhouse et al 1985). In each of her 20 pupils the dyslexia tutor (McMahon, 1988) found a previously unrecorded history of speech therapy, subtle word finding or slight articulation difficulties.

Pattern 6: Developmental dyscalculia – in some cases there was a recorded difficulty in acquiring arithmetic skills and concepts especially in reciting tables and mental arithmetic (Miles, 1993). Many of these difficulties could be accounted for by the difficulties in reading and writing and with the dyslexic problems in establishing verbal codes (Montgomery 2011c).

Pattern 7: Complex specific learning difficulties – in some unlucky cases there were several conditions, dyslexia, dyspraxia, dyscalculia and SLI. The complex condition made their educational needs difficult to deal with in mainstream or in the remedial setting. In these cases a school that specialised in dyslexia provision was essential to meet their needs but was not always available. Severe cases are also likely to find their way to specialist clinics and research centres and it is also the case that their complex difficulties often define the way research on dyslexia is pursued and the results it obtains.

Pattern 8: Comorbidity – Dyslexia was often found associated with other specific learning difficulties such as Attention Deficit Hyperactivity Disorder (ADHD) Asperger Syndrome and dyspraxia (Kutscher 2005). Research by Montgomery, (2000); and Silverman, (2004) showed that **handwriting difficulty** is an underlying problem in underachievement and can be overlooked. It is comorbid in dyslexia (30-63% Kaplan 2000; Montgomery 2007), ADHD (50% Kaplan, 2000) and Asperger Syndrome (90% Henderson and Green, 2001).

2.2 Ratio of boys to girls with dyslexia

The ratio of boys to girls in mainstream with dyslexia (N=537) was 1.2 to 1, respectively (Montgomery, 2008). In the remedial centres it was 4 to 1 and even 5 to 1 (Montgomery 1997a) boys to girls. This data was consistent with the findings of Rutter and Caspi et al. (2004) of a ratio across Europe of 1.4 to 1 in many thousands of cases. Montgomery (1997a)

found that girls were referred a year later than boys and their problems were more intractable. It was more common that boys' records revealed a history of behaviour problems as a response to their difficulties and thus it was likely that help for them would be requested sooner.

Dyslexic girls' needs appear to be overlooked in many situations and this was also borne out by 18 female teachers on a Master's programme in SpLD who had had dyslexic difficulties (personal communication, 2006). They reported that they had not received any specialist help and had been left to manage their problems and been regarded as slower learners. This helped them understand their pupils' needs and brought them to the programme. They had residual problems with spelling and composition that we could use the programme itself to remediate. This meant that as they taught strategic approaches to spelling to their pupils they could learn to apply them to their own misspellings rather than use the rote methods they had adopted from their earlier schooling.

2.3 Patterns and definition

Developing definitions of reading, literacy and dyslexia is problematic in that although we can observe outcomes we cannot see the processes that lead to them. These processes have to be inferred from performance on tasks. When it was thought that dyslexics were 'Word Blind' it was inferred that they must have visual perceptual and visual memory problems for words so visual training was important in remedial reading programmes. The teaching method that fitted with this was 'Look and Say' for whole words. Only after a sight vocabulary of 50 words was known was it thought appropriate to teach some sounds or phonics to support word attack skills. But it was this regime that appeared to cause 4 per cent of children to become dyslexic in England (Rutter and Tizard et al. 1970) and only 1.5 per cent in Scotland (Clark, 1970) where the 'Phonics First' method had been retained. In her extensive research on the effects of Phonics First versus Look and Say teaching methods, Chall (1967, 1985) found similar results. What seems surprising is that these studies had so little impact for so long in the UK until phonics was promoted in Government reports (National Literacy Strategy; DfEE, 1998; Rose Report, 2006).

Reading sub skills are not clearly defined either. The processes in the **acquisition** of reading and spelling skills may not be the same as reading and spelling **development** when basic skills have been acquired and need to be practised and extended. Most children appear to be able to learn by any method that is well-structured and sequential, dyslexics do not. Most dyslexics these days do eventually learn to read and write but the delay can cause skills deficits of 2 to 5 years (Montgomery 2007) and it could be the effects of this that is what we observe and cause what some call disordered or 'bizarre'. Although much research has concentrated on early screening, if the definitions it operates on are imprecise, the results will be equivocal and fail to predict to later problems accurately.

It is necessary to consider the effect on teaching methods for acquisition. Already differential effects of Phonics versus Look and Say have been identified (Chall, 1967, 1985; Rose 2006). This might also have a bearing on theories of literacy development some of which suggest that logographic items appear first unrelated to sound properties in children's writing (Frith,, 1980). Could this be extended as a function of a teaching method that starts with Look and Say and is this true of Phonics First systems? Can children's scribbles tell us more than a little about dyslexia, theory and practice?

Definitions, as Snow (1973) showed, can define the research, the practice and the way we think about problems and can limit our propensity for appropriate action. For example the most widely held definition that emerged in the dyslexia field was based upon the extensive surveys of Clements (1966,). He formed the view that dyslexia was a difficulty in learning to read despite conventional instruction, adequate intelligence and sociocultural opportunity. He concluded that it was a disorder that was frequently constitutional in origin.

As can be seen, there are a number of problems with this definition. It is a definition by exclusion where once we have excluded low intelligence, poor teaching, disadvantaging backgrounds and so on then the problem we have left must be dyslexia. But '*dys-lexis*' simply means a difficulty with words, particularly in their written form, a circular definition. The fact that the difficulty is defined as a problem in 'learning to read' and 'words in their written form' focuses us upon reading; not literacy skills as a whole, and in particular ignores spelling. This focus has given reading difficulties a primacy over spelling that may not have been justified. It perhaps reflects the era when the definition was formed and the emphasis on reading in education that was opposed to methods that were regarded as 'the spelling grind'. It certainly reflects the situation in the UK both then and now and it has created problems both for teaching and for research and practice. It has directed remedial provision for five decades. In the document *Excellence for All Children* (DfEE, 1997, p. 15) it firmly states:"As teachers become increasingly adept at tackling reading difficulties children with specific learning difficulties (such as dyslexia) should in all but exceptional circumstances be catered for in mainstream schools". Teachers in the UK are thus indoctrinated with this belief and target their practices accordingly.

In addition, Clements' use of the word 'disorder' carries with it another whole set of assumptions and attitudes that may not be justified. It suggests that the system from which dyslexia emanates is disordered and dysfunctional, (Regrettably some medics have prescribed drug treatments). In the end it can suggest that dyslexia is not remediable but might be patched up or be compensated for, developmental delay is not considered.

More recently, the British Psychological Society established an expert group from amongst its members researching dyslexia to advise the Society. In 1989 it offered the following definition of dyslexia: "A specific difficulty in learning, constitutional in origin, in one or more of reading, spelling and written language which may be accompanied by a difficulty in number work. It is particularly related to mastering and using written language (alphabetic, numerical and musical notation) although often affecting oral language to some degree".

This definition covered the main areas of dyslexic difficulties that research had identified since Clements and tried to give focus to the key issues. Implicitly it tells us now that dyslexia may be found across the ability range and that written language or coded symbols applies to text, number and musical scores.

My main concern with this definition is that it suggests that a dyslexic might be thought to have only **one** of the areas of difficulty i.e. reading or spelling or number and this does not fit with the case histories of dyslexics already described. They do have reading AND spelling difficulties, but rarely if ever, reading without spelling difficulties, although a significant number seem to have spelling with no reading difficulties. For example, one cohort of dyslexics (N=288; Montgomery, 2007) in the case studies referred to a Dyslexia Centre all had significant reading and spelling problems (2.8 years below chronological age).

On the waiting group of 90 pupils one third of the group appeared to have spelling problems alone.

A general guideline was in operation based on government approved SEN training that reading itself must be 20 per cent lower than the pupil's chronological age to secure specialist remedial support. This ignored the issue that if the child was well above average ability 'mental age' we could expect them to have reading that is advanced towards this level. This meant that bright children with dyslexia might be put on a waiting list for remedial help but were less likely to receive support. Moreover, those whose reading was adequate but had severe spelling problems would not be referred but remain on the waiting list.

The British Dyslexia Association's (BDA, 2004) definition was somewhat influenced by that of the BPS but went on to extend it, to cover what teachers might observe in their dyslexics and touches on the old theories of origin: "Dyslexia is best described as a combination of abilities and difficulties, which affect the learning process in one or more of reading, spelling and writing. Accompanying weaknesses may be identified in areas of speed of processing, short term memory, sequencing, auditory and or visual perception, spoken language and motor skills. It is particularly related to mastering and using written language, which may include alphabetic, numeric and musical notation. Some children have outstanding creative skills, others have strong oral skills. Dyslexia occurs despite normal teaching, and is independent of socio-economic background or intelligence. It is, however, more easily detected in those with average or above average intelligence".

2.4 British Dyslexia Association definition, 2011

> "Dyslexia is a specific learning difficulty which mainly affects the development of literacy and language related skills. It is likely to be present at birth and to be lifelong in its effects. It is characterised by difficulties with phonological processing, rapid naming, working memory, processing speed, and the automatic development of skills that may not match up to an individual's other cognitive abilities. It tends to be resistant to conventional teaching methods, but its effects can be mitigated by appropriately specific intervention, including the application of information technology and supportive counseling".

In this definition we can see a 'work in progress' and a move to include the current main definitions on the nature and possible origins of the difficulty e.g. phonological processing, rapid naming, working memory, etc. It does however now include matching against other higher cognitive abilities not just chronological age – 'may not match up to an individual's other cognitive abilities', this will help some gifted dyslexics. There is a vast body of research on phonological difficulties in dyslexia and a strong belief in it as a theory of origin and it is now the prevailing paradigm (Frederickson and Frith et al, 1998; Snowling 2000, Vellutino, 1979). The argument goes that if the underlying phonological difficulties are addressed then the dyslexia will be remediated. But is this so?

3. An examination of some contrary views of dyslexia theory and research

3.1 Speed of auditory processing hypothesis

Tallal (1980; 1994) suggested that the dyslexic problem lies in an inability to process sensory input rapidly, particularly the auditory information contained in speech (Goswami, 2008).

The deficit is in the millisecond range and could be due to cell size differences in the left language hemisphere which are smaller in dyslexics (Holmes, 1994, p. 27). But is this size a cause or a result? The processing difficulty, it is argued would create problems in 'b' and d' perception for example which last only 40 milliseconds. When the sounds were separated by 100 milliseconds dyslexics could discriminate them.

The question we need to ask is why, when pupils are taught sounds of the letters in isolation and they hear, see and write them in Reception that dyslexics fail to learn them, why is speed an issue? It appears to become an issue only if we teach by 'Look and Say' or the sentence reading methods alone. Even if methods begin with Look and Say, why is it that the introduction of symbol-sound correspondence or phonics work later does not overcome the 'dyslexic' problem? Why does dyslexia also occur in languages such as Italian, which have closer symbol-to-sound correspondence than English? Galaburda (1993) argued that this deficit does not indicate a cause of dyslexia but is a secondary effect associated with a deeper cause.

It would appear that the research has not concentrated enough upon the early acquisition processes in literacy where much time in classrooms is also spent on saying and writing single sounds using the popular 'Letterland' approach (Manson and Wendon, 1997). Although young children have better ability than adults to discriminate between sounds, what we do know according to Liberman, Shankweiler et al. (1967) is that the human ear is incapable of distinguishing the sounds in syllables. Most often the initial sound is accompanied by a stronger burst of energy and thus is easier than the rest of the syllable to become aware of (for reading) then to segment (for spelling). The rest of the letters are shingled on top of each other making them impossible to separate out. Thus teaching 'c - a - t', 'cat' is set for failure. But teaching of onset and rime makes sense 'c - at'. Especially when we have a picture clue to help us. The 'I Spy something beginning with' - game is thus a very important part of early learning in school. Dyslexics were asked which segmentation format was easiest for them to remember and said that 'c / at' was much easier for them than 'ca / t' or 'c–a–t' (Montgomery 1997a). The point this illustrates is that if early reading skills are supported by spelling skills that include segmentation, especially onset and rime methods (Bryant and Bradley 1985) then speed of processing is irrelevant in the acquisition period.

3.2 Working memory hypothesis

Working memory as already noted, appears to increase as literacy skills improve (Koppitz, 1977). Recent research by Gathercole (2008) has shown that training working memory improves concentration and attention in ADHD. However, it did not enhance the literacy skills of a group of dyslexics (McGhee, 2010). Vellutino (1987) showed that the verbal encoding required in many memory tasks produced deficits in dyslexic performance even on visual items because of attempts to sub-vocalise or name the items. This was confirmed by Montgomery, (1997a) when dyslexics were asked to tell how they remembered a set of visual symbols such as the Coding tasks on WISC and Digit Span. Giving some sort of label assisted their recall thus it is not just a visual or visuo motor recall task but a verbal-visuo-motor task.

3.3 Double deficit hypothesis

This theory (Wolf and Bowers, 1999) holds that there is a deficit in phonological processing in addition to slowness in naming and decoding fluency (Wren, 2005). The evidence used is

that dyslexics even when they have learned to read and write remain slow in their reading and decoding of text. However, Rumelhart & McClelland (1995) using computer simulations, concluded that the slowness in recovered dyslexics was due to their lack of experience of print compared with normal subjects. Teacher research (Taylor, 2007) confirmed this with dyslexic cases and normal poor readers.

3.4 The phonological processing hypothesis

This is the dominant current theory in dyslexia, which postulates that in the majority of cases, dyslexia is thought to be due to an underlying **verbal processing difficulty** particularly in the **phonological area** (Brown and Ellis, 1994; Bryant and Bradley, 1985; Chomsky, 1971; Frederickson, and Frith et al 1997; Frith, 1980; Golinkoff, 1978; Liberman, 1973; Snowling, 2000; Vellutino, 1979)**.**

According to this theory, phonological processing deficit can give rise to:

- inability to appreciate rhyme
- lack of phonemic awareness
- poor development of alphabetic knowledge
- lack of development of symbol to sound correspondence
- lack of development of phoneme segmentation skills
- lack of spelling development at the higher levels
- lack of metacognitive awareness of spelling

These phonological skills and abilities are thought to underlie the development of good spelling and reading and appear to develop incidentally in most pupils during reading and writing but not dyslexics.

Phonemic awareness and appreciation of rhyme appear to be more closely associated with reading skills and there is a strong correlation between poor phoneme awareness and later reading difficulties (Bryant and Bradley, 1985; Frederickson and Frith et al 1997). Although 'strong' is a correlation of <0.71,this is only 50 % predictive of the capacity to later literacy skill (Pole and Lampard 2002).

Alphabetic knowledge, symbol-to-sound correspondence and phoneme segmentation are more associated with spelling. Poor skills in these areas have the highest correlation or predictive power with later dyslexia (Golinkoff, 1978, Liberman, 1973, Treiman, 1993. The stronger predictive capacity of segmentation skills appears to be because even with direct teaching of phonics the dyslexic may not be able to acquire early alphabetic and segmentation skills. Thus I argued that these skills, or lack thereof, could be used as a primary indicator of dyslexia and dysorthographia in Reception classes if we were to examine children's writing. In support of this notion it can be seen that if some of the phonological skills on dyslexia tests are examined, they actually require spelling skills for success. For example, the Alliteration and Spoonerisms tests used in the Phonological Assessment Battery (PhAB; Fredrickson, Frith & Reason, 1997) can be viewed as requiring phoneme segmentation skills. The same is true for phoneme tapping tasks (e.g., Tunmer & Nesdale, 1982), whereby, dyslexics have shown poor performance, while showing normal performance on syllable tapping (Montgomery 1997a). We know that pupils will be able to decipher syllable beats by ear if they can hear and understand speech. But phoneme tapping

is different since it requires segmentation of the syllable itself, which Liberman et al (1967) showed they cannot do. For example, Montgomery (1997a) has showed that when asked to tap 'seven', 'write' 'bad', dyslexics tapped 3 or 4 times, (svn or sevn) 3 times (rit), and 3 (bad) times. Matched chronological age controls tapped 5 times, 5 and 4 times and 3 times, whereas young matched reading age controls performed as poorly as the dyslexics. In a series of such experiments (Montgomery, 1997a) it became clear that phoneme tapping was only accurate if the dyslexics and controls could spell the word in the first place. Similarly, phoneme segmentation involving cutting off the initial sound c -at was facilitated by secure knowledge of the letter sound 'c'. In other words these exercises were subskills of spelling and dependent upon it.

4. Can early writing be used as an indicator of dyslexia?

Figure 1 below shows the spelling samples of three typically developing children aged 5 years 1-2 months who had not been taught to write; Yacob (top), William (middle) and Kelly (bottom). In contrast, Figure 3 shows scripts of three dyslexic children; Steven age 6.5 years (top), Caroline aged 7 years (middle) and David aged 8 years (bottom). The 5 year olds have picked up a considerable amount of phonic and orthographic information, whereas the dyslexics show some whole word knowledge for common words they will have copied many times but lack the symbol sound knowledge they need. When we look at scripts from dyslexics it is puzzling to think why they seem unable to learn a few basic phonic or phonemic skills in the infant school that would support their reading and writing. The alphabet system is elegant, efficient and simple, why can they not learn it? We need to ask what accounts for the deficits seen in the phonological processing area when stripped down to the bare essentials – a failure to learn to make symbol-to-sound connections or learn alphabetic knowledge in often very bright individuals.

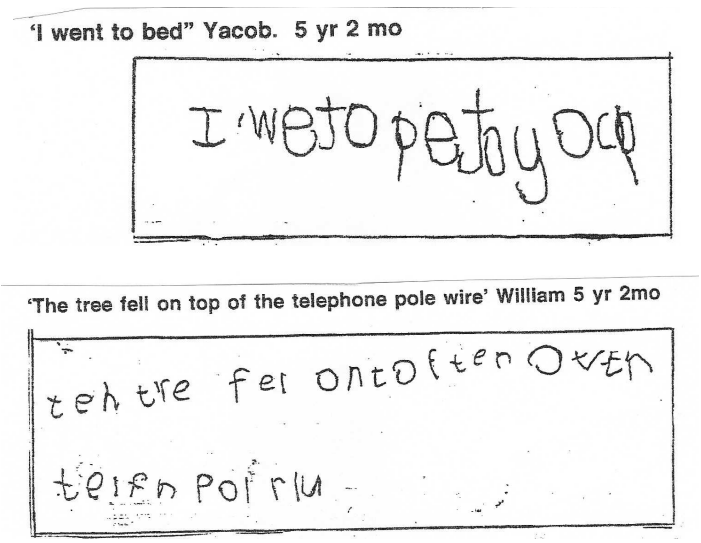
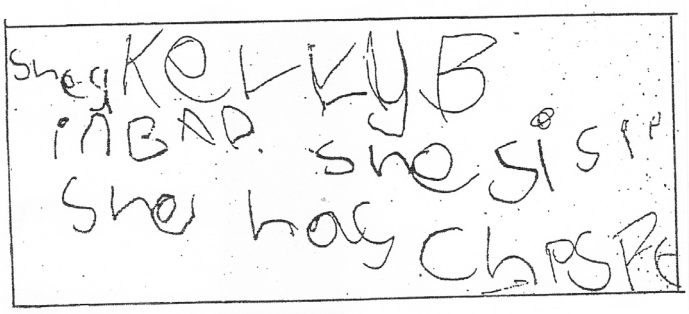
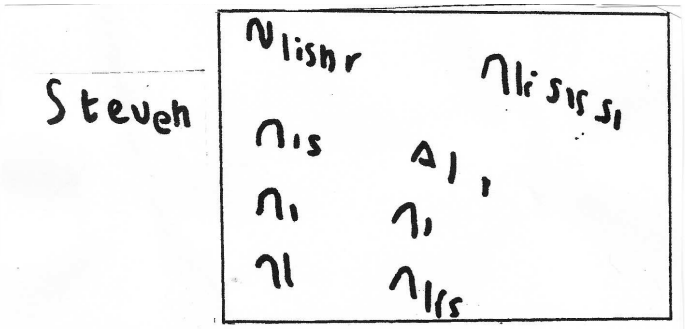


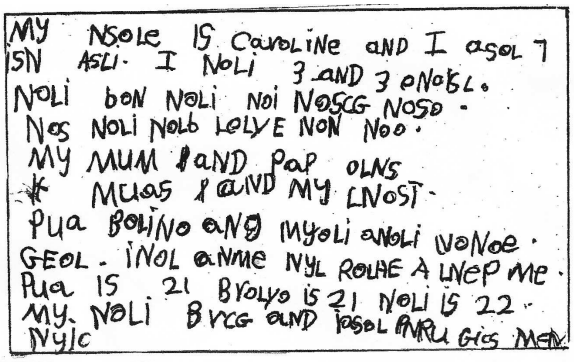
Fig. 1. The spelling of 3 non dyslexic beginning writers 5yr 1-2m Yacob and William above and Kelly below (all figures reduced by 50%)

Kelly B. 'She is in bed. She is sick. She has chickenpox.' 5 yr 1 mo





Steven, 6 years 6 months



Caroline 7 years
'My name is Caroline and I am 7 years old. I have 3 brothers and 3 sisters. Some of them live at home and so do my goldfish. Paul, Breda and Mark still live at home. They are a lot older than me. Paul is 21, Breda is 21 and Mark is 22. My other —'

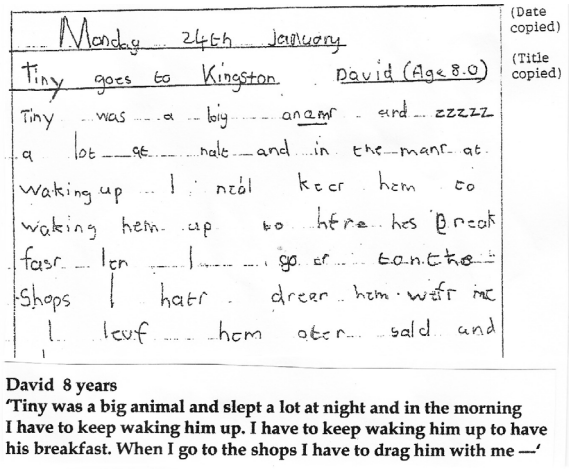


Fig. 2. The Writing of three dyslexics

It would seem that lack of alphabetic knowledge in early writing can be used as an early warning that dyslexia may well develop. Above, David is just beginning to crack the code.

5. An intersensory integration theory?

The core deficit in dyslexia appears to be the early failure to learn to associate sound with symbol. It requires the visual processing area of the brain (Occipital cortex) to make links between the grapheme (visual symbol) with the auditory processing area (Temporal cortex) and the sound of that grapheme (the phoneme). These linkages are found to take place in the angular gyrus (Parietal cortex; Geschwind, 1979) of the language hemisphere (left in most people). This is the intersensory integration area for sounds and symbols. But what could cause this, a dissociation problem?

The easy association between the arbitrary symbols of the alphabet and their sounds that most beginners pick up incidentally during reading is lost in dyslexics. Even in classrooms where sounds are being said slowly and the connections between them and the graphemes are made explicit, dyslexics can fail to learn them (Hurry, Silva & Riley, 1996). Even when phonics is introduced or provided in a general school based remedial programme, teachers report that they can fail to remember the connections from one day to the next (personal communication from clinical cases, 1997a, 2007)). They do not learn to segment the sound c / from 'cat' for example as other children do (Montgomery, 1997a). Ehri (1979) has suggested that this is because the sound is an **abstract perceptual unit** that has to be linked to the arbitrary graphemic unit. Could this abstract nature be the core of the problem in learning sounds and alphabetic information from which all the rest stems?

Studies of the alphabet itself lead to some significant facts. The alphabet was apparently only invented once (Gelb 1963) and was invented in the context of a Semitic language by the Phoenicians. Their Semitic language was consonantal, without vowels and consisted of 22 sounds (much like modern Hebrew). Here perhaps is the clue. If the originator had used the key cues of the articulatory pattern of each of the 22 consonants by which to assign a

symbol, an alphabetic system had been invented. Anyone could learn it except perhaps dyslexics? The articulatory pattern would indeed be the only **concrete clue** between the arbitrary and abstract sound and the arbitrary and abstract visual symbol. The three of them would make a kinaesthetic multisensory triangle, to which we add the writing component, **a four-way relationship**. A more complex intersensory integration system than is overt in the term symbol-sound correspondence.

If the dyslexic does not have the awareness of the articulatory 'feel' of a particular phoneme it will make the sound - symbol association particularly problematic to acquire. As sounds with the same symbols appear in different forms (**allophones**) in syllables, this can quickly become confusing. Graphemes represent phonemes, not allophones, and so do not distinguish between different pronunciations. It is the articulatory pattern that is **concrete** and remains roughly the same and which can be used to connect the sound and the symbol. By using articulatory cues a pupil should be able to decode the consonantal structure of a syllable or a word even though vowels might be missed. This could account for the scaffold or skeletal phonics seen such as in **mstr, ws, bd** and so on when beginning spellers and dyslexics have begun to break the alphabetic code.

In a series of pilot studies and controlled experiments this articulation awareness hypothesis was developed and tested (Montgomery, 1997a). Table 1 below shows the results of the final controlled study (Montgomery, 2007) in which it was found that dyslexics in comparison with spelling age matched controls had significantly poorer articulation awareness skills even though they were two and a half years older. The higher scores on phoneme segmentation of controls and experimental group dyslexics matched their higher literacy scores compared to those in the waiting group who had made little progress in reading or spelling.

In order to assist articulation awareness and the acquisition of early phoneme segmentation to improve basic spelling skills a number of strategies termed 'multisensory mouth training' (Montgomery, 1984) for spelling were developed and used in association with the remedial programme. This involves asking the pupil to articulate a letter sound such as 'l' and then describing where in the mouth the key articulators are touching. E.g., "where is the tip of your tongue now? Are your lips open or closed? Feel your voice box, what is it doing?" and so on. Edith Norrie (1917) must have done this when she developed the Letter Case and taught herself to read and spell. Although she used a mirror to help her with her articulatory phonics this was not done in the articulatory awareness research.

Measures	Chronological Age	Reading Age	Spelling Age	Phoneme Segmentation	Articulation Awareness	IQ
Controls (N=84)	7.94	8.63	8.02	11.84	7.75	110.03
Dyslexics (N=114)	12.90	7.95	7.62	10.27	4.31	110.43
Waiting (N=30)	8.97	6.71	6.0	4.13	5.87	112.67

(Key: 15 or 10=items on tests; PS = phoneme segmentation (15 items) ; AA = articulation awareness (10 items) IQ=Intelligence Quotient,

Table 1. Results of the Main Articulation Awareness Investigations (Montgomery, 2007 p 79)

It was very surprising to discover that the dyslexics were frequently, confused about where in the mouth the key articulators were touching. Most of the dyslexic group were already started on the remedial Teaching Reading Through Spelling (TRTS; Cowdery, Montgomery et al., 1994) programme, (not those on the waiting list), but without the articulatory aspects of the phonics. Phoneme segmentation and reading /spelling abilities were strongly associated.

This leads to the questions: (1) which programmes help dyslexics crack the alphabetic code? and (2) how? Dyslexia tutors favour the 'multisensory training' method and the DfES (2010) recommends it but although many programmes include it not all are equally successful.

6. Remedial intervention patterns

Tables 2, and 3 below show the outcomes for different types of remedial programme, in particular the difference between the Orton, Gillingham, Stillman based Alphabetic-Phonic-Syllabic-Linguistic (APSL) programmes and others, non APSL that are phonics based. Reading and spelling ages are used as they tell a clearer story than percentiles and standard scores. The criterion for remedial success is for a programme to give at least two years progress in each chronological age year otherwise the dyslexic can never catch up. The researchers compared dyslexics' progress in one year on either APSL or non APSL programmes to find which programmes were effective.

Ridehalgh (1999) examined the results from teachers who had undertaken dyslexia training courses for a number of factors such as length of remediation, frequency of sessions and size of tutorial groups in dyslexic subjects taught by three different schemes: (1) Alpha to Omega (Hornsby and Shear, 1978), (2) Dyslexia Institute Language Programme (DILP/Hickey, 1977), and (3) Spelling Made Easy (SME, Brand, 1993). She found that when all the factors were held constant the only programme in which the dyslexics gained significantly in skills above their increasing age was Alpha to Omega.

Measures	Sample size	Reading Progress	Spelling Progress	Researcher
A to O	N=107	1.93	1.95	Hornsby et al (1990)
TRTS	N=38	2.45	2.01	Montgomery (1997a)
H & A to O	N=50	1.21	0.96	Ridehalgh (1999)
TRTS	N=12	3.31	1.85	Webb (2000)
TRTS	N=12	4.04	3.00	Gabor (2007)
A to O	N=10	2.4	2.4	Pawley (2007)

Table 2. Progress Made in One Year on APSL Programmes

However, in a follow up, Ridehalgh (1999) found that the users of the Hickey programme in her sample had found it more convenient to leave out the spelling pack work and the dictations! The data also showed that in **paired tuition** the dyslexics made greater gains than when working alone with the teacher. This is an important consideration in terms of the dyslexics' progress and of economics in schools. All the four tutors in the 1997 TRTS study (Table 2) worked with matched pairs of pupils.

Measures	Sample size	Reading Progress	Spelling Progress	Researcher
Eclectic mix	107	0.53	0.32	Hornsby et al (1990)
Eclectic mix	N=15	1.06	0.16	Montgomery (1997a)
SME	N=50	0.69	0.65	Ridehalgh (1999)
SME/TRTS	N=12	2.2	1.14	Webb (2000)

KEY for tables 2 and 3: TRTS – Teaching Reading Through Spelling (Cowdery et al 1994); SME Spelling Made Easy (Brand 1993);
Hickey /DILP Hickey's Dyslsexia Institute Language Programme (Hickey 1977); A to O Alpha to Omega (Hornsby et al 1976)

Table 3. Progress Made in One Year on Non APSL Programmes

Webb (2000) found that she had to cut out the dictations and some of the spellings pack work because the lessons were too short. As can be seen in Table 2 this has had an effect on the spelling results. Webb also found that in using SME (Table 3) the pupils were not making progress unless she introduced the articulatory training from TRTS to link the sound and symbol. This accounts for the better SME results than for Ridehalgh's groups.

In Gabor's (2007) study, at an international school the high progress dyslexics had supportive backgrounds and were encouraged at home to do the homework.

Pawley's (2007) study took place with 10 pupils placed in a special school for Emotional and Behavioural Difficulties (EBD). Before and after the programme the incidence of behavioural problems were recorded on the Conner's Comprehensive Rating Scale for EBD (2008) and it was found that there had been a 30.7% decrease in unwanted behaviours with all pupils' behaviour improving to a significant degree except one. The behaviour problems decreased as the literacy skills improved. Halonen and Aurola et al (2006) also established a significant correlation between reading difficulties and EBD.

These data lend support to the case observations that many pupils develop EBD as a result of their literacy problems (Edwards, 1994; Kutscher, 2005, Montgomery, 1995;). In addition, research by the BDA (Singleton, 2006) showed that 52% of young juvenile offenders were dyslexic and the Dyslexia Institute (2005) reported that the incidence in the prison population was three to four times that in the general population.

Dyslexia is thus a very serious problem for society as a whole if so many of its sufferers turn to crime. Being bright and unsuccessful in school can easily lead to alienation and even rage (Miles, 1999). Thus dyslexics may have to find other ways of being successful and using their gifts. This may mean turning to crime or becoming an independent entrepreneur. 30 per cent of highly successful entrepreneurs reported they were dyslexic (CBI, 2000).

6.1 What must a remedial programme for dyslexics include?

When a word is pronounced by a careful speaker most of its constituent phonemes can be heard and 'felt'. It is this 'citation' form that spellers need to use to support their spelling until a word is learned and can be written automatically by direct reference to the lexicon.

Learning to feel the initial sound can also give strong **concrete** support to the onset and rime strategy by helping segment the initial sound for reading as well as spelling. When

Peter, one of McMahon's (1988) dyslexic pupils aged 10, was given four twenty minute **'multisensory mouth training'** support sessions he made two years reading and spelling progress in a fortnight. It is unusual to make such an enormous gain in fortnight, none of the other 19 subjects did, but the training provided Peter the clue he needed to gain metacognitive insight into the whole process of spelling.

It will first be the consonants and consonant blends that are identified by 'feel'. The vowels do not cause the articulators to make contacts; they are open mouthed non contacting 'voiced' sounds. Vowels are varied by the position of the tongue and the shape of the lips and are particularly difficult to notice in medial positions. Beginners may often be seen mouthing their words for spelling both aloud and subvocally. Earlier researchers such as Monroe (1932) and Schonell (1942) were most insistent about the articulatory aspect of learning to spell. It is a form of metalinguistic awareness that dyslexics may fail to acquire in Reception class but may gradually do so at a later stage. Training in this area could well enable the Reception class dyslexic to overcome this phonological disability. It may then make the acquisition of the higher order aspects of the language far easier for them and some may not become disabled at all.

In cases where dyslexia goes unremediated, particularly in severe dyslexics, we find very little alphabetic knowledge, while phonemic skills are shown in the spelling (see figure 2 above). However, by about the age of 8 years many dyslexics do begin to 'crack the alphabetic code' by themselves. This is especially so where great efforts are made with multisensory phonics. By this age however, the child would be three years behind peers in literacy development and as each year goes by, the gap lengthens because the literacy teaching environment of junior schools is geared to subject teaching using already acquired literacy skills.. In addition, dyslexics would by then need to overcome errors, which cannot be unlearned. Instead, means need to be found for giving the new learning a greater propensity to be elicited.

The reason for delay in development of this refined form of propriosensitivity or integration of information above the level required not to bite the tongue is not entirely clear. What has been known for many decades is that visual, auditory and articulatory elements **must be firmly cemented in writing** (Stillman, 1940, Schonell 1942). Attention in writing is focused and helps reinforce the articulatory and kinaesthetic bridge between the visual and auditory symbols. This makes the four-way intersensory relationship **auditory - visual - articulatory and manual kinaesthetic.**

Typical of all successful remedial programmes is the focus on spelling as well as reading reinforced by writing especially in cursive for reasons discussed later. Blending and word building for spelling take place as soon as two or more letters are learned and this is followed by a steady structured and cumulative introduction to the main features of the language in its written form. This is knowledge that other children pick up automatically in the environment of print but dyslexics do not, probably because they are stuck at a pre-literate stage for so long and then on the mechanics of the process.

7. Are there levels or subtypes of dyslexia in educational terms?

Although researchers such as Boder (1973) proposed that there were subtypes in dyslexia based upon the types of errors they made in spelling and reading this is questionable. The subtypes were named dysphonetic and dyseidetic types with some having a mixture of

both. These subtypes were used to describe dyslexics showing difficulties with phonics and others with problems in the images of words or correct orthography. The analysis was based upon the numbers of Good Phonetic Equivalents.

Boder's data does not support the notion of subtypes but rather it illustrates different levels of the dyslexics' knowledge. At the lower end of the learning scale with little or no phonic knowledge would be dyslexics like Steven, Caroline and David whose writing is shown in figure 2 above. This can be called Level One Skills. Yacob, William and Kelly in figure 1 above are in a transitional stage. Those who have phonic knowledge but lack a fully developed knowledge of orthography appropriate for their age and ability can be considered as at **Level Two** such as Scott in figure 3 panel 3 below.

Level 2 dyslexics have cracked the alphabetic code and are developing a knowledge of orthography but it is incomplete. As they are usually in late junior or secondary school they have little chance of ever catching up as their curricula are now geared to reading and writing to learn. However Level 2 dyslexics do need remedial intervention but it needs to be on a different level from Level 1 dyslexics.

In Figure 3 below the writing of three dyslexic pupils is shown. Chelsea's writing in the top panel of Figure 3 below, illustrates a pre-phonetic scribble stage where she has not yet cracked the alphabetic code, she has not yet been referred for remedial help. Joshua (Fig. 3 middle panel) has some knowledge of phonics and writes "I like to ride on my bike, I have fights with my brother", but his knowledge is very incomplete for a Year 5 pupil and suggests a serious earlier problem. He has been formally identified as dyslexic and referred for remedial help. Scott in Year 10 (Fig. 3 bottom panel) has knowledge of phonics and some orthographic knowledge but it is too incomplete for his age group and what he needs to be successful in the curriculum. He has had dyslexia support but it was not effective enough.

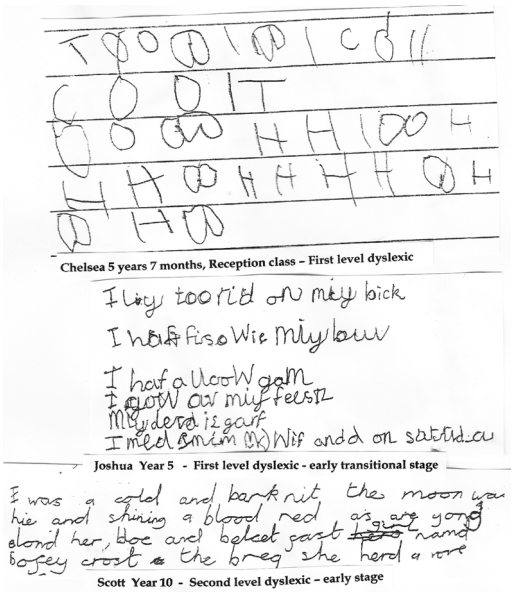


Fig. 3. Level one and level two of the dyslexic condition

Identifying these two levels is essential in the remediation process for so many of the dyslexics interviewed complained at length of forever repeating multisensory phonics work with different tutors although they already had a grasp of most of it. Their problems lay in their difficulties in building words from their phonic knowledge and arriving at the correct spelling and in correcting old misspellings. Increasing their fluency in writing however, enhanced their reading skills even when it was not the focus.

It was the tail end of this level 2 problem that was identified in a cohort of student teachers. It was for them that the **strategic approach to spelling** was developed. It was originally called the 12+1 Cognitive Process Strategies for Spelling (12 cognitive strategies plus 1 simultaneous oral spelling (Montgomery, 1997a).

7.1 Developmental stages and progress in spelling. Marsh and Friedman et al. (1980)

Marsh, among others has proposed a series of stages that most children follow in the development of writing. The basic structure has been adapted here as follows:

- Stage 1: pre-communicative / emergent stage, random scribbles and letter-like shapes, no knowledge they represent sounds
- Stage 2: semi-phonetic / alphabetic stage, pupil begins to gain an understanding of the alphabetic principle (mstr)
- Stage 3: phonetic stage, once pupil can spell consonant – vowel – consonant words progresses to other patterns; can segment speech sounds in simple words, may use rules incorrectly and over-generalise, reversal of letters in words is common until a spelling age of about 8 years, knows many common 'irregularly' spelled words. (marstr)
- Stage 4: transitional stage: pupils apply what they have learned about one-syllabled words to multisyllabled words, and have a developing knowledge of common patterns and rules. (masrtir)
- Stage 5: orthographic stage where the spelling approaches correct orthography for most common words except where new vocabulary is being learnt. (master)

These stages are helpful knowledge when working on the development of spelling in the general classroom as they can enable the teacher to monitor progress and decide how next to intervene. However it is more helpful with dyslexics to consider the barriers to their learning that occur at level one (symbol – sound knowledge) and deal with this and then at level two correcting their existing misspellings at whatever stage they present and providing strategies for generalisation to other wider vocabulary (Montgomery 1997a, 2007; author's personal observations as a clinician).

7.2 Remedial interventions at level one

Steven, aged 6.5 years (Fig. 4) was found on a visit to a student teacher who was keen to help him. He had received some phonics help already but it had not penetrated. He had been taught in a Look and Say reading teaching regime in Reception. The student was quickly taught the multisensory articulatory method of phonics work (Montgomery, in Cowdery et al. 1994 pp. 93-100). Unfortunately the joined up writing that should be part of the system was banned in this school until the children went into the junior section.

However the results are clear and after 6 x 20 minute sessions withdrawn, Steven, who originally has some word / syllable structure knowledge and uses the letters in his name repeatedly but without any phonics sense, has learned to write legibly. He has cracked the code! He was delighted with his achievement and so were his teacher and the student.

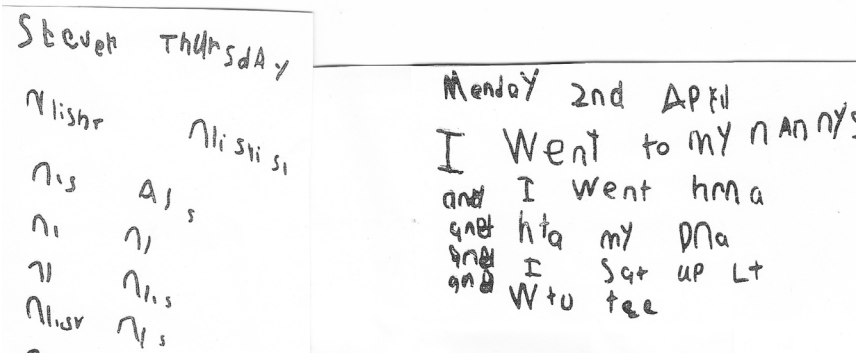


Fig. 4. Steven's spelling before and after intervention with 'articulatory phonics'

James' (aged 8.5 years) progress in figure 5 below was typical after a 50 minute lesson twice a week with his matched peer at the specialist centre. He made 3.0 years progress in reading and spelling in 1.3 years.

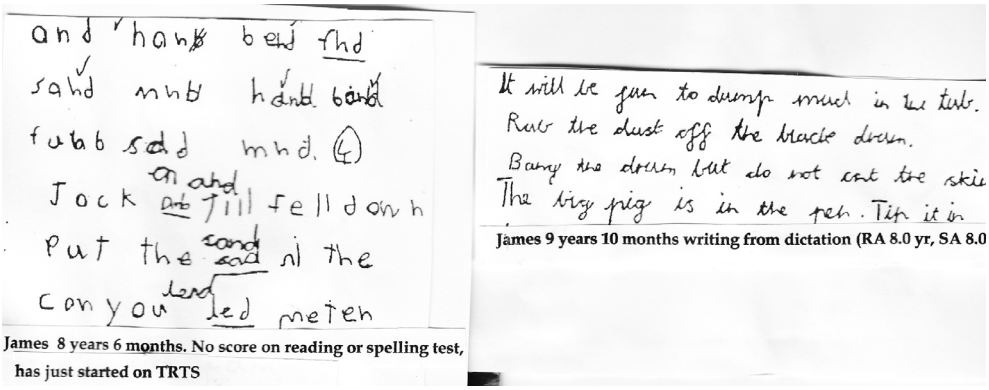


Fig. 5. James' progress on TRTS in 1.3 years

7.3 Other early screening attempts

A check of knowledge of lower case alphabet letters with 200 children in ten Reception classes in urban and suburban settings showed that after three weeks in school the majority of pupils knew between 5 to 10 names or sounds (Montgomery, 1997a). Those who knew none fell into several groups, one or two were developmentally immature and seemed unable to grasp what they needed to do, one or two were unable to concentrate on the task and had very disturbed backgrounds, the rest tried and made random associations and were unaware how they were making sounds such as: - l t d a s f in their mouths.

Forsyth (1988) followed up a cohort of pupils at age 7, who had been given a Local Education Authority (LEA) screening in three Reception classes. Forsyth found that failure to develop alphabetic knowledge was the best predictor of later reading and spelling ability at age 7 (although this was not originally included in the LEA screening inventory). Screening of this kind could be part of all teachers' Baseline Assessment procedures as well as an analysis of writing in Reception. Although Vellutino (1979) discounted the intersensory integration theory of Birch and Belmont (1964) the evidence upon which he did so was slight in comparison with his work on the other theories. This was mainly due to a problem arising from the difficulties in devising test items that would serve the purpose. Most of them were contaminated by naming or verbal processing.

Geschwind (1979) had first identified the left angular gyrus as the area where auditory, visual and kinaesthetic information is integrated. He suggested this system may not be functioning adequately due to a disconnection phenomenon. Geschwind proposed that this could cause the dyslexics' deficiency in processing and connecting graphemic symbols to their sounds. It may cause them to switch processing to the other hemisphere (Witelson 1977) which is not so well set up for verbal processing.

If there are such deficits, whatever their cause, the remedial system would need to retrain areas around the dysfunction to cause them to take over the original functions. From the experiences of stroke patients the difficulty involved in developing compensatory mechanisms, and the tremendous effort that needs to be made as soon as possible are well known (National Institute for health and Clinical Excellence NICE, 2011). It could be the reason why the system of multisensory training in writing connecting grapheme to phoneme is so essential in the first stages. In fact, experienced tutors reported that once the first few sounds and letters have been learnt the process then speeds up.

Brunswick et al. (1999) showed that young dyslexic adults, when reading aloud and using non-word recognition tests, had less activation in the left posterior cortex than controls. A deficit in the left hemisphere of the brain was said to be implicated. However, it can be argued, that this may be a **result** and not a cause of their dyslexia. Their phonological processing was not secure. In fact, when the dyslexic difficulties are given remediation and begin to clear up then the brain activation changes towards resembling that of controls (Kappers, 1990).

7.4 Remedial intervention at level two

Diagnosis of dyslexia is so often delayed for years that the pupil has developed some reading and spelling skills but they are far from automatic and errors are carried forward from earlier learning that intrude when the mind is on content rather than the basic skills of transcription. It is these pupils we can regard as having skills at Level Two. Their knowledge of sounds and symbols needs to be checked and omissions corrected but the whole multisensory training regime does not need to be set up. Instead they need interventions at the orthographic rather than the alphabetic level to supply them with the knowledge they need for word building and spelling correction and development.

7.4.1 Correcting misspellings (Montgomery, 1997a, 2007, 2011d)

The problems that have to be overcome in correcting misspellings are several. Among these, three are described:

1. The misspelling may be a creative attempt to spell an unknown word. In this case a strategy can be introduced to correct it and it may easily be learned if it is quickly understood and put to use.
2. The misspelling may have been acquired several years previously and reappears in various forms inconsistently when under pressure.
3. The misspelling may have been acquired several years ago and has defied all previous attempts.

In the first case the important feature is to lay down a new correct version in the memory. In the second and third cases the misspelling and its variants have already been learned and as they are old habits have a long track record and need **special measures** to correct them and keep them corrected. Most teachers will use Look - Cover - Write - Check to try to correct a misspelling. However, it may help lay down a new memory but it will not correct or remediate a learned misspelling. To do this two strategies are needed, these are: (1) Cursive writing and (2) Cognitive Process Strategies (CPS).

7.4.2 Why CPS and cursive writing are BOTH needed

It would appear that the incorrect spelling has already been stored in two places:

a. In the motor control cortex for learned movements (Kimura cited in Springer et al 2003 pp 304-5)
b. In the word memory store or orthographic lexicon (Barry, 1994)

Automaticity has already been established and it is this with which we have to deal. The incorrect spelling has also a memory entry in the word memory store or lexicon. We do not actually appear to lay down word memories as icons but more as rules and features and these have to be linked to the meanings of the words we learn as we learn to talk. When writing from our imaginations we think of the words we want and automatically summon the spellings we have stored and these activate the linked motor programmes. Thus we have to correct the entry in the lexicon as well as the motor programme.

A further problem is that we appear not to be easily able to forget memories in either store once we have learned them. We need therefore to lay down a new memory trace that has a higher profile than the old one so that when we summon it from the meaning linked spelling bank the correct new one emerges rather than the old incorrect one, hoping that from lack of use the old one will decay over time.

The Cognitive Process Strategies for Spelling (CPSS; described below in detail) is a strategic approach that serves the purpose of opening up the misspelling in the lexicon to intellectual scrutiny so that when we want to spell the word correctly we have given it a higher profile. As we write we can then feel it coming and can pause long enough to select the correct spelling by using the cognitive strategy. At the same time we use the cursive SOS strategy to write over the area of error.

The **Simultaneous Oral Spelling (**SOS; described below in detail) strategy used with the CPSS in the correction stage helps establish a new motor programme and pathways so that the correct word elicits the new motor programme instead of the old one. The more the new form of the word is elicited and used in writing the stronger the links become so that after a while the pause and use of the CPSS is no longer needed as the correct version comes out

each time. When used with teacher education students their error rates on the third year and the final 4th year exams dropped significantly (Montgomery, 1997a). Their error types also changed from 'bizarre' to common error types and 'slips of the pen'.

7.4.3 The strategic approach to spelling – 12 Cognitive Process Strategies for Spelling (CPSS)

1. **Articulation** - The misspelt word is clearly and precisely articulated for spelling. Teachers need to encourage clear, correct speech, during classwork and in reading aloud explaining why. Mispronunciations should be corrected such as 'chimney' not 'chimley'; and 'skellington' to 'skeleton'. The point where stress comes in a word can also be noted for this will help in correcting the spellings such as harass and embarrass.
2. **Over articulation** - The word is enunciated with emphasis on each of the syllables but particularly the one normally not sounded or in which there is the schwa sound e.g. parli (a) ment, gover (n) ment, w(h)ere, ban-an-a.
3. **Cue articulation** - The word is pronounced incorrectly, e.g. Wed -nes - day, Feb - ru - ary. This points up the area of difficulty to cue the correct spelling.
4. **Syllabification** - It is easier to spell a word when we break it down into syllables, misdeanor - mis / de / mean / our, criticed crit / i / cise / d. Poor spellers and young spellers need to be taught to do this and learn to clap the beats in names and words to help them. Although the syllable division will vary, as they learn more about the structure of language they will learn to build this in to the syllabification.
5. **Phonics** - The pupil needs to learn to try to get a comprehensible skeleton of the word's sound translated into graphemic units. At first the skeletons or scaffolds will be incomplete e.g. bd for bed, and wet for went in regular words. If the words are irregular such as cum / come at least the phonic scaffold is readable and other strategies can be taught to build the correct word.
6. **Origin** - Often the word's root in another language may give clues -op / **port** / unity. the medial vowel in this word is a schwa sound and is often spelt incorrectly with 'e' or 'u'. Finding that the original meaning comes from an opening, a port or a haven means the pupil has a strong clue to the spelling.
7. **Rule** - A few well chosen rules can help unravel a range of spelling problems e.g. the l - f- s rule, that is l, f, and s are doubled in a one syllabled word after a short vowel sound - ball, puff, dress; and i before e except after c, or the two vowel rule - when two vowels go walking the first one does the talking (usually). Exceptions to these rules are saved and learned as a group e.g. pal, nil, if, gas, yes, bus, us, plus, thus.
8. **Linguistics** - The syllable types open, closed, accented and unaccented are taught as well as the 4 suffixing rules which govern most words, as well as the difference between and uses of base words and roots.
9. **Family/base word** - This notion is often helpful in revealing silent letters and the correct representation for the schwa sound e.g. Canada, Canadian; bomb, bombing, bombardier, bombardment; favour - ite, sign, signature signal. These are real families of words not common letter strings. A base word is 'form' to which we add prefixes and suffixes (reform, reforming) or make compound words back-ward.
10. **Meaning** - Separate is commonly misspelled as sep / e / rate. Looking up the meaning in a dictionary can clear this up because it will be found to mean to divide or part or even to pare. The pupil then just needs to remember 'cut or part' and 'pare' to separate.

11. **Analogy** - this is the comparison of the word or a key part of it with a word the pupil does know how to spell., e.g. 'it is like boot - hoot, root' or 'hazard' is one 'z' like in 'haze' and 'maze' . This is the closest to the letter string approach that we want to come.
12. **Funnies** - Sometimes it is not possible to find another strategy and so a 'funny' can help out e.g. 'cesspit' helped me to remember how to spell 'necessary'

7.4.4 A seven-step protocol for using CPSS

Younger pupils and those with poorer spelling will need more of the first five CPS strategies and little or no dictionary work to begin with.

1. The pupil selects **two** misspellings to learn in any one session.
2. The pupil identifies the **area of error,** usually only one letter with the help of the teacher or a dictionary.
3. The pupil puts a **ring round** the area of error and notices how much of the rest is correct.
4. The pupil is taught (later selects) a **CPSS** to correct the misspelling, a reserve strategy is also noted
5. The strategy is **talked over** with the teacher and is used to write the corrected spelling.
6. The spelling is **checked** to see if it correct - the dictionary can be used again here.
7. If correct the pupil covers up the spellings and writes the word three times from memory in **joined up / full cursive** writing using **SOS especially over the area of error if full cursive presents a problem.**

Examples: Acco(m)modate: Ac (prefix) - com/mod **(Linguistic rule - double m after the short vowel in the closed syllable)** - ate (common syllable ending) Potato(e) - tomato, 'toes are plural, o is one' ; long vowel /o/ Most modern words manage without 'es' e.g. pianos, radios, cellos, avocados

7.4.5 Simultaneous Oral Spelling (SOS)

- Look up the correct spelling in a dictionary with help if needed
- Write down the word from the dictionary **naming** the letters
- Teacher and pupil check that the spelling is correct
- Cover the spelling and then the pupil writes it from memory saying the **name** of each letter as it is written
- Check the spelling against the original to see if it is correct
- Repeat this procedure three times
- The criterion for success is that the word should be spelled correctly THREE times in a row
- Check the spelling again the next day to see if it can still be written correctly
- If an error is made build the word with wooden lower case letters then repeat SOS

This procedure was first described for remedial spelling and writing for dyslexics by Bessie Stillman (in Orton, Gillingham and Stillman,1940).

7.4.6 Casework examples with CPSS

First the lexicon entry is corrected by using CPSS and then SOS to help correct or modify the motor programme. We must do both, one or other will not work because of the inter-connectedness of thinking, writing and spelling.

13 year old Alex's work before and after 5 mini sessions of CPSS

Before:

He eat him, now I'm no exspert but **anemals** do behve **lick** that, and he did the same to the others but the had a **difrent** larws and the **PLeos cort** him eath is the most **stangest** plac I **onow Yors fafhly**hoblar

The words in bold were those chosen by Alex to tackle in the sessions.

After:

Dear Hoblar I fanck you for your letter. I've looked into your animal consirns and animals on earth have a good reputasn like Robin Hood, the Fox and Bugs Buny. I have Beny watching a lat of fims and cartoons and I disagree with you. For example police dog's save live's and guide dog's help blind people. I'll meet you at the space cafe on Wednesday 4th July

See you soon Blar

J. a Year 8 pupil (C.A. 13.6 years 9 RA 9.1 and SA 8.7 years) using CPSS - teacher's reflections

'The student and I gained a lot from this experience. The student said she thought that she'd never learn to spell words that she got wrong and she felt that now at secondary school they had given up on her. She felt by working together that she had used a lot of her own ideas when investigating words and she had enjoyed having the responsibility. She said that when we talked about things together she understood more than if she was just listening - - - She said she'd always thought that she wasn't as clever as other children and had labelled herself as 'thick' - - - I had seen a marked improvement in J's confidence, enthusiasm and spelling abilities

Casework example 1 using CPSS: Natalie was a student in Year 10, aged 15. She was somewhat impulsive and had dyslexic type difficulties (spelling age 12.4 years). She had been in the learning support class for three years. '..Her report said 'there are numerous difficulties in school as Natalie does not like to listen to criticism and does not accept help to improve her work'. Her writing was sometimes difficult to read especially when writing words she was unsure of. Her written work did not reflect her level of understanding, she wrote the minimum required, did not proof read, made many grammatical errors and was very slow at writing.

In the first CPSS session the teacher and Natalie spoke at length about the strategies and then Natalie was given a dictation. She selected the words 'edge' and 'comfortable' to tackle, put a ring round her area of error, looked them up in the dictionary, and cue articulation was suggested for ED-ge and then a 'funny' which arose when Natalie said she was reminded of a dog called 'Edger/ Edgar', then they used the phrase 'Edger has the edge'. Natalie then chose cue articulation and syllabification for the word com -FORT- able as well as the phrase which amused her 'The fort is comfortable'. She became very keen on using CPSS and over the next few weeks kept asking if she could have her spellings checked and if she could have new ones. She enjoyed identifying the word, looking it up in the dictionary

and thinking of strategies to overcome it. However what she did not enjoy was the SOS and cursive writing. She was reluctant to use them despite being told why and felt they were too much like other spelling programmes she had been given before but which had failed.

A few days after the first session Natalie came in very excited because she had 'heard alarm bells ringing' when writing the word 'edge' in Food Technology and as a result of 'the bell' she had taken more time over the word and been able to correct her own writing'. Over the next three weeks they spent 10 minutes every learning support lesson reviewing spelling. Only in these sessions could Natalie be persuaded to use SOS. After a few more weeks all the words she had been learning were put into a dictation. Although Natalie complained she had not had time to review them in fact all were spelled correctly except 'thought which was given as 'though'. She said that now whenever she used the target words the alarm bells would ring although sometimes it took her a while to remember the strategy. For example she still wanted to spell the word leisure as 'leasure' but now her brain told her not to.

Other important things emerged during the mini lessons and that was Natalie became willing to share some of the stresses her problems with spelling had caused and opened a floodgate on homonyms that had troubled her for years. She was surprised that no one had thought to teach her the four suffixing rules before. As the sessions progressed she gained in confidence and was enjoying studying spelling and getting very obvious benefit that she herself could see and experience.

Her dyslexia tutor explained: 'Many of the students I work with have been following dyslexia spelling programmes with private tutors for years with little or no improvement in their ability to spell accurately when under pressure especially in a test or exam. When I first read about CPSS I was a little dubious as it seemed a time consuming way of teaching students correct spelling however I was desperate to find something which would work after years of repeatedly correcting the same errors'.

> 'It did not take long for my experimental student to feel confident about what she was doing..... it has been an extremely positive experience as it really helped raise her self esteem as well as improving the accuracy of her spelling.....I have now introduced the CPSS to all the classes I teach.'

Casework example 2 using CPSS: Carl was 9 years 11 months with a spelling age of 8 years 4 months and diagnosed by an educational psychologist as 'moderately dyslexic'. He was given a 100 word dictation from his Harry Potter reading book. He misspelled 12 words and identified 5 of them: - monning (morning); itsalf (itself); bewiching (bewitching); foled (followed); turbern (turban). and :- cristmas, midde, coverd sevulal, soled punshed thay

Lesson One follows: - In the period of a fortnight they dealt with his errors

Christmas: Carl missed the 'h' in this word and said he sometimes missed the 'r' as well. Cue articulation: 'We pronounced the word 'Christ - mas'. We talked about the fact that Christmas is all about Jesus i .e. Christ. We looked up 'mass' in the dictionary and discovered that it can mean a meal or a body and that at Christmas we have a big meal to celebrate that Jesus came to earth in human body. Carl had never realised the word 'Christ' was in Christmas.

'Funny': As soon as I spelt this word correctly Carl said 'Oh look my brother's name" Carl has a brother called 'Chris' whose name he can spell quite happily so it really helped him to

remember that the name 'Chris' is in 'Christmas'. SOS: He found it quite hard to make himself use the cursive writing at first but said it got a lot easier as he repeated the word. He also found it easier to remember the spelling if he shut his eyes.

Followed: Carl spelt this as 'foled' Syllabification: Carl needed help to see how the base word 'follow' can be broken down into syllables, Then he spotted the word 'low' Analogy: He was able to think of a rhyming word for 'foll' i.e. 'doll' As soon as I mentioned the past tense he remembered he needed a 'ed' ending. (Author: After analogy with 'doll' it might have been useful to introduce the l-f-s rule and/or doubling after the short vowel sound)

At the outset of lesson two Carl spelt the two words correctly and he and his teacher proceeded with the next two words. After the six sessions he was given the dictation again and Carl correctly spelled all the 12 target words. Initially he resorted to the former spelling of 'covered' and 'punishment' but in both cases he immediately realised his error and self corrected. He was quite hesitant over 'several' but got it correct after some thought. He initially put 'terban' for 'turban' but corrected it immediately. His writing in the post test was more joined.

7.4.7 When can CPSS be started?

This is a frequently occurring question and teacher researchers have found that as soon as alphabetic knowledge is established, and this does not mean learning all the sounds in alphabetical order but in use order, word building knowledge can begin. (See the *Developmental Spelling Programme* Montgomery 1997b for over 100 mini lessons and *Spelling Detective Dictionary*, (Montgomery, 2011e) for CPSS strategies. For example if a beginning speller writes 'bd' for 'bed' this is the time for basic syllable structure to be introduced - that syllables are the beats in words – practice clapping the beats in your name etc., - every syllable in English must contain a vowel. Which vowels do we know so far? etc.

Parrant (1989) introduced all her class of seven and eight year olds to CPSS strategies and compared their results with a matched class receiving Look Cover-Write-Check and the usual skills rules such as 'magic e'. The CPSS class's spelling errors decreased very significantly in comparison with the controls who went on making the same errors. The SEN group's errors in the CPSS class also decreased significantly but not by such a large amount. Since this time other teacher researchers have had similar success but have been working with small groups and individuals. Recently many teacher researchers on the MA programmes have also used CPSS with small groups and individuals and have been able to help them gain 2 years advance in spelling and reading often within six months. Interestingly enough they all report that although not directly addressed reading also improved at least to the same level. (Androsysgyn, 2002; Butt, 2003; Morley, 2001; O'Brien, 2004)

8. Why cursive writing in remedial work is important

As already indicated earlier, a significant proportion of dyslexics have accompanying difficulties in handwriting due to fine motor coordination difficulties or DCD\dyspraxia. Kaplan (2000) found this was 63 % in her sample. In the early half of the 20th century pupils in English schools learned a fully joined or cursive script from the outset 'civil service hand' with no more apparent difficulty than current print learners. It is thus a mid 20th century

phenomenon that UK pupils learn print script first before converting to a joined script (Jarman, 1979). Even though ligatures are now built into the teaching system to support joining (DfEE, 1998). In many other countries cursive is still taught from the outset.

Experiments in teaching cursive from the outset again have taken place in a number of LEAs and have proved highly successful in achieving writing targets earlier and for a larger number of children (Low, 1990; Morse, 1991). It is also found to be equally readable. However custom and practice or 'teaching wisdom' is very hard to change and extremely rigid attitudes are frequently found against cursive (Montgomery, 2003).

The research of Early (1976) advocated the exclusive use of cursive from the beginning. This was because it was found that the major advantage of cursive lay in the fact that each word or syllable consists of one continuous line where all the elements flow together. This means that the child experiences more readily the total form or shape of a given word as he or she monitors the kinaesthetic feedback from the writing movements. Handwriting therefore supports spelling and this contributes to literacy development.

The cursive recommended here can be seen in figure 6 below. It is ovoid rather than upright to promote fluency and seeks to find the most efficient joining strategies. Single lower case letters and the initial lower case letters of all words begin on the line with a lead in stroke, there are loops below the line to assist flow in joining but none above, this helps reduce confusions between lines. A crucial factor of academic success at secondary level is a student's writing speed. It determines how easily and comprehensively he/she can take notes in class and can have a major influence on success in examinations. Ziviani and Watson-Will (1998) found that cursive script appeared to facilitate writing speed.

The reasons for teaching cursive writing are particularly relevant to students with handwriting coordination difficulties (developmental dysgraphia) unless their problems are severe when other strategies may need to be implemented. Specialist dyslexia programmes of Gillingham and Stillman (1956); Hickey (1977); Cowdery and Montgomery et al., (1994) all base their remediation on it in a multisensory training system. The reasons are it:

- aids left to right movement through words across the page
- stops reversals and inversions of letters
- induces greater fluency in writing so enables greater speed without loss of legibility
- more can be written in the time
- speed and fluency can make a difference of a grade at GCSE, A level or in degree programmes
- the motor programmes for spelling words, their bases and affixes are stored together (Kuczaj, 1979)
- space between letters and between words is orderly and automatic
- a more efficient fluent and personal style can be developed
- pupils with handwriting coordination difficulties experience less pain and difficulty
- legibility of writing is improved
- reinforces multisensory learning linking spelling, writing and speaking.

In addition, if taught from the outset it eliminates the need to relearn a whole new set of motor programmes after the infant stage and there is a more efficient use of movement because of cursive's flow.

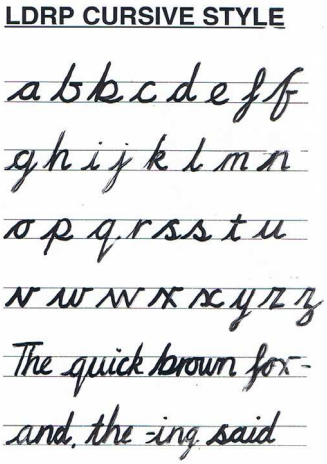


Fig. 6. Example of the recommended LDRP Cursive

This 'LDRP' ovoid form with a consistent forward (or backward) slope to aid running writing is more user-friendly for most pupils than the upright Palmer cursive used in the TRTS programme.

In the remedial setting, lines to write on and cursive have been found to be essential and Wedell (1973) had insisted that children with coordination difficulties must learn to use a continuous writing movement. Dysgraphics such as these have difficulties, once they find where to make contact with the paper in making the required shape and to the precise size and length. As soon as they lift the pen from the paper again in print script to make the next letter the directional, orientational and locational problems begin all over again. The effort involved becomes greater, the pen is seized more tightly, the knuckles go white and the whole body tenses and there is a further loss of fluency. To aid focus and concentration and stop contralateral movements the edge of the desk may be held and the tongue stuck out. It can take half an hour of formidable effort to produce a neat sentence.

Pupils with handwriting difficulties from whatever cause, whenever they can, try to avoid any written task and complain of pain and fatigue (Alston, 1993) and some even become disruptive when they are required to sit down to write. Teachers well know that, "Now write it down" can bring forth a chorus of groans. But avoidance and difficulties with writing tasks can also have a serious effect on spelling and handwriting development through consistent lack of practice. In addition lack of personalised tuition as children are learning to form their letters and monitoring on the writing task because of large classes can result in poor acquisition of writing skills as many pupils teach themselves through copying exercises.

Handwriting difficulties appear to play a much more significant role in underachievement than has often been realised (Montgomery, 2000, 2003; Silverman, 2004). Whilst estimates of developmental coordination difficulties vary between 5 to 10 per cent of the school population, ten per cent or more of pupils have mild handwriting coordination difficulties (Gubbay 1976, Laszlo, Bairstow et al 1988. Rubin and Henderson (1982) found that 12 % of pupils were considered by their teachers to have serious handwriting difficulties. Whilst in a

survey carried out with 3rd year junior school pupils in Cheshire, Alston (1993) found that according to assessments made by 5 experienced remedial teachers just over 20 % of pupils were not writing well enough for the needs of the secondary school curriculum.

In a recent analysis of Year 7 scripts it was found that 30 % of pupils had some form of handwriting difficulties in form or coordination and this led to problems in legibility and speed. A speed at this age of 20 words per minute in a 20 minute essay was found to be necessary to access the school curriculum (Montgomery 2007b). The average speed of the cohorts (N=531) was 13.2 similar to that in a survey by Allcock, 2001 (N=2701). Very few primary teachers said that they regarded speed as an important feature in children's writing they focused more upon legibility and neatness (Stainthorp, et al 2001). However fluency and speed are important and this can be achieved by the majority of pupils with light training of their teachers (Christenson & Jones, 2000). Perhaps the 1 % with overt DCD should be exempt from writing and be given laptops as they find it impossible to speed up sufficiently although they invest huge effort such as in the case of David in Figure 8 below.

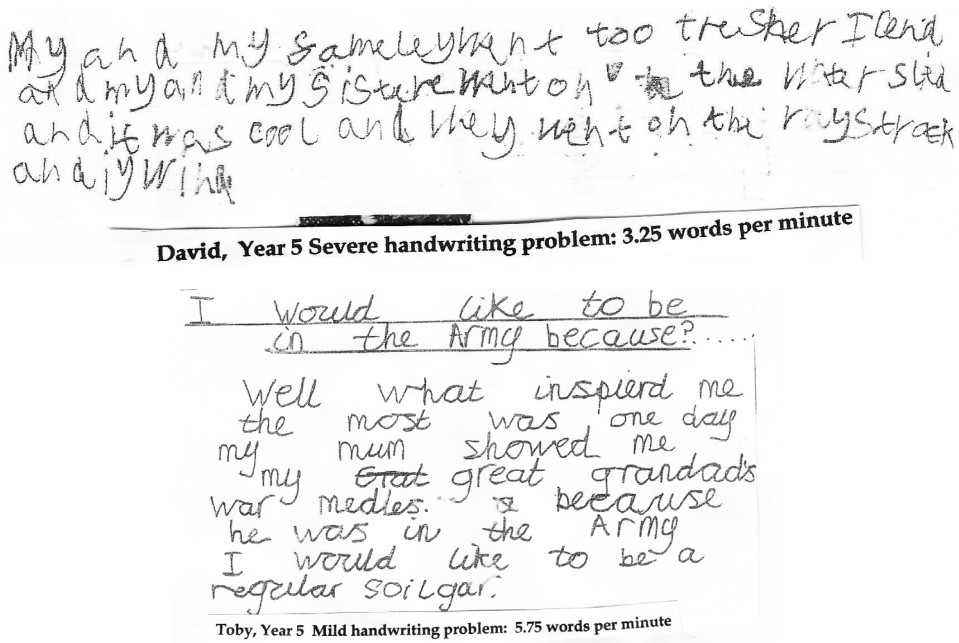


Fig. 7. Handwriting difficulties – David above and Toby below

The checklist in Figure 9 below can be used with a pupil to get him or her to decide on the errors they make in their writing. Choose TWO features on which to intervene. The features that will give the most effect and quickly have been found to be making **the base** of the letters all the same size by using double lines to write between and trying to make **the slope** of all the letters' ascenders and descenders go in the same direction (Montgomery, 2007, 2011a).

8.1 A checklist of key indicants for diagnosing handwriting coordination difficulties

- the letters do not stay on the line
- the writing drags in from the margin towards the mid line
- wobble and shake observable on strokes in letters
- variation in 'colour' of words, lightness and dark as pressure varies or fatigue sets in
- spaces between letters are too wide
- spaces between words too are large and sometimes too small
- rivers of space run down between the words
- difficulties making complex letters so they appear large or as capital forms T, W, S, K, F
- Variations in size of other letters so they appear as large or capital forms e.g. n,m,u,h,
- a non standard pencil grip (e.g. not a tripod grip, flexible or rigid) can hamper writing and achievement,
- great pressure hampers fluency, makes holes or dents in the paper which can be felt on the reverse side
- contra lateral body and arm movements may be observed
- effort and grip causes whitening of the knuckles
- tongue may be stuck out
- fatigue rapidly sets in
- complains of aches and pains after only short periods of writing

An index of 4 or 5 such indicants would warrant further investigation and intervention.

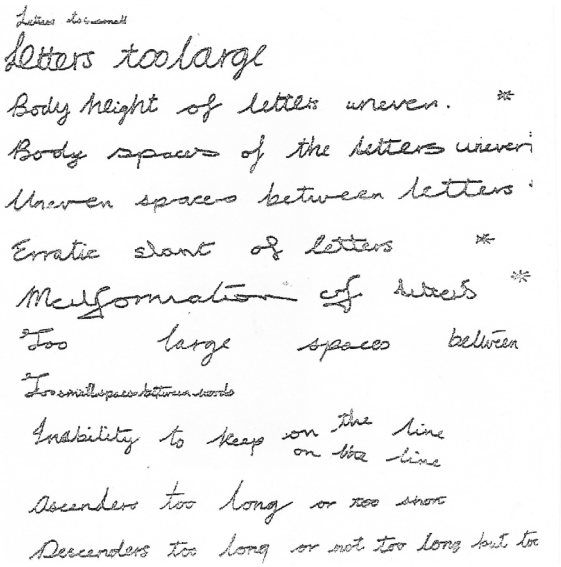


Fig. 8. A checklist to use to identify form difficulties

Some other physical characteristics – suggesting coordination difficulties

Look at the lines on the paper made by the writer, writing his or her own name and address for example.

- You can feel the writing on the reverse side of the paper, too much pressure and energy exerted.
- Is the writing variable in dark and light pressures or in being too faint and then too dark.
- Is the writing shaky and wobbly? Can suggest tremor and anxiety.
- Is the writing scribbly and or spiky? Suggests a motor co-ordination problem.

Practice in the motor movement in writing developing rhythm and flow can improve the writing patterns indicated above.

8.2 Automatic development of skills

Before the writer can become fluent in higher order compositional skills it is essential that the lower order skills of spelling and handwriting become automatic (Berninger, 2004). If a writer has to reflect on how to spell words and make up spellings or has difficulty in forming letters and words fluently in handwriting then the mental efforts required or mental resources that are committed to these processes are directed away from composition and the development of ideas, narrative and argument. The requirement is that the correct spellings should reel out from the lexicon automatically as we write just as our hands move over the keys of the piano when we have learnt to play a tune.

This means that comprehension is affected as well as the higher order skills required to write compositions and essays. If lower order skills are not automatic then the whole process of writing is slowed down and may become truncated and disrupted. Extensive researches by Berninger (2004) and her colleagues have shown that the two best early predictors of higher order compositional skills are speed of writing the letters of the alphabet and coding or spelling skills.

We know that dyslexics are poor at developing automatic levels of these skills because of their difficulties and this is not surprising for they currently acquire them late and thus have many years less practice using them. This problem persists and Connelly et al. (2001) Connelly et al. (2005) have shown this problem exists for them throughout primary and secondary schools and into higher education as they become undergraduates. At university level this can mean that they obtain degrees in the humanities and social sciences that are at least a class lower than might be predicted from their other skills. It was similar findings with teacher undergraduates that led to the investigation of handwriting problems especially of more able subjects and its contribution to underachievement (Montgomery, 2009, 2011e). It appears to be a silent disability and frequently ignored. Fortunately for dyslexics the early specialist remediators, Gillingham, Stillman and Orton (1940) were well aware of the problem and included penmanship, especially in the form of cursive writing in their programme. It is this programme and method upon which all the most successful programmes are based. For what makes a dyslexia friendly school or environment see Study Guide 4 (Montgomery 2011d)

9. Summary and conclusions

The main thrust of this chapter is that whilst the focus in education is the teaching of reading, the needs of dyslexics are different. Their core difficulty lies in the area of spelling

first in 'cracking the alphabetic code'. This could be done in the Reception Year by the class teacher with some specific training. If this is not done or is not successful then remedial provision needs to be instituted in Year 1 for 'Level One' dyslexics and this should involve the use of a specialist programme such as TRTS or Hickey that systematically involve spelling, handwriting and articulatory phonics as well as reading. Older dyslexics and those with dysorthographia – 'Level Two' dyslexics, also need specific spelling help and this can be provided by the 'Strategic Approach' to spelling, CPSS already described. Both types of remedial intervention must produce 2 years uplift in skills in each year if they are to be considered successful. Addressing spelling transfers to reading whereas the reverse is not the case.

In theoretical terms it is suggested that the dyslexia is the result of a dissociation in the intersensory integration of sounds with symbols that causes early failure to learn sound and symbol correspondence. If not overcome the delay in this aspect hampers literacy development and leads to laying down many errors that in themselves become difficult to overcome. Referral in the UK may come 3 to 6 years too late and then poor literacy skills and old errors undermine achievement at all levels. In research terms it is suggested that there should be more focus on spelling and handwriting as part of literacy investigations and that a programme of early screening and intervention in Reception should be explored. In educational terms teachers in training need a better understanding that dyslexia is not just a reading problem and learn of the power and interest that can be generated by encouraging children to adopt a 'detective approach' to spelling to help lose their 'learned helplessness'. An associated benefit from overcoming literacy problems that has emerged is the decrease in problem behaviours in classrooms.

Overall this chapter has sought to present an alternative perspective to the mainline theme in dyslexia research and intervention to date. It proposes that reading is not the core difficulty and that concentration on this aspect causes confusion in diagnosis and diminishes the effectiveness of the remediation. In many instances it causes it to fail. The concept of dyslexia as an irremediable lifelong problem also needs to be challenged as does the popular notion of a sex ratio of 4 to 1 with boys more likely to have the problem than girls. A vast body or research is already available on dyslexia but it is suggested that much of it is missing the point and a closer fit needs to be made between the dyslexic's experience and the methods of meeting his or her needs.

10. References

Allcock, P. (2001) Update September 2001: 'Testing handwriting speed' *PATOSS Bulletin* November p 17

Alm, J. and Kaufman, A 2002 'The Swedish WAIS-R factor structure and cognition profiles for adults with dyslexia *Journal of Learning Disabilities* 35 (4) 321-33 ISSN

Alston, J. (1993) *Assessing and Promoting Writing Skills* Stafford, NASEN

Andrusysgen, K. 2002 'An investigation of Cognitive Process Spelling Strategies with a group of poor spellers' Unpublished MA SpLD, London: Middlesex University

Barry, C. 1994 'Spelling routes (or roots or rutes); In G.D.A. Brown, and N. C. Ellis (1994) *Handbook of Spelling: Theory, Process and Intervention* 27-49 Chichester: Wiley ISBN 0-471-94342-9

BDA (2004) htpp:// www.bda-dyslexia.org.uk/main/information/adults/ao1what.asp

Berninger, V. 2004 'Review of handwriting research and intervention' Keynote paper Annual DCD Conference, Oxford April

Birch, H. G. and Belmont, L. (1964) 'Auditory -visual integration in normal and retarded readers' *American Journal of Orthopsychiatry* 34 352-61 ISSN 0002-9432

Boder, E. (1973) 'Developmental dyslexia: A diagnostic approach based on three atypical reading patterns' *Developmental Medicine and Child Neurology* 23 663-87 Online ISSN 1469-8749

BPS (British Psychological Society) (1989) Deliberations of the Expert group on Dyslexia Leicester: BPS

Brand, V. (1993) *Spelling Made Easy 14th Edition* Baldock: Herts: Egon

Brown, G. D. A. and Ellis, N. C. (1994) *Handbook of Spelling: Theory, Process and Intervention* Chichester: Wiley ISBN 0-471-94342-9

Brunswick, N., McCrory, E., Price, C. J., Frith, C. D. and Frith, U. (1999) 'Explicit and implicit processing of words and pseudo words by adult developmental dyslexics' *Brain* 122 1901-17 Online ISSN 1460-2156

Bryant, P. and Bradley, L (1985) *Children's Reading Problems* Oxford: Blackwell

Butt, H, (2003) 'An investigation into the use of cognitive process strategies for spelling in the development of spelling skills of a group of Year 7 pupils' Unpublished MA SpLD dissertation London: Middlesex University

Calder, N. 1970 *The Mind of Man* London: BBC Publications ISBN 563-10155-5

CBI (Consortium of British Industry) (2000) CBI Survey of Entrepreneurs in Industry London: CBI

Chall, J. (1967) *Learning to Read: The Great Debate* New York: McGraw-Hill

Chall, J. (1985) *Stages in Reading Development* New York: McGraw-Hill

Chomsky, C. (1971) 'Write first, read later' *Childhood Education* 47 (6) 296-9 Online ISSN 1573-1707

Christensen, C.A and Jones, D. (2000) 'Handwriting: An underestimated skill in the development of written language' *Handwriting Today* 2 56–69 ISBN 1-982932-16-6

Clark, M. M. (1970) *Reading Difficulties in Schools* Harmondsworth: Penguin ISBN14080213-4

Clements, S.D. (1966) *National Project on Minimal Brain Dysfunction in Children - Terminology and Identification Monograph No 3 Public Health Service Publication No 1415* Washington DC: Government Printing Office

Connelly, V. and Hurst, G. (2001) 'The influence of handwriting fluency on writing quality in later primary and early secondary education' *Handwriting Today* 2 50-7 ISBN 1-872832-16-5

Connelly, V., Dockrell, J., Barnett, A. (2005) 'The slow handwriting of undergraduate students constrains the overall performance in exam essays' *Educational Psychology* 25 (1) 99-109 eISSN 1489-5820

Conners, C.K (2008) *Comprehensive Behaviour Rating Scale 3rd edit* London: Pearson ISBN 9780749148-39-3

Cowdery, L.L., Montgomery, D., Morse, P., & Prince-Bruce, M. (1994) *Teaching Reading Through Spelling Series: Foundations of the Programmes Reprint* Wrexham: TRTS Publishing ISBN 1-900283-01-8

DFEE (1997) *Excellence for All Children* London: DfEE ISBN 0-10157852-1

DfEE (1998) *NLS The National Literacy Strategy Guidance* London: DfEE

DfEE (2010) 'Multisensory approaches to learning' http://waes:elearn.waes.ac.uk/moodie-resources/Basic%Skills (Accessed 2/8/2010)

DILP (2005) *Dyslexia Institute Language Programme* (Eds) J. Walker and L Brooks Staines: Dyslexia Institute

Early, G. H. (1976) 'Cursive handwriting, reading and spelling achievement' *Academic Therapy* 12 (1) 67-74 ISSN 0001-396X

Edwards, J. (1994) *The Scars of Dyslexia* London: Cassell ISBN0-304-32944-4

Ehri, L. C. (1979) 'Linguistic insight threshold of reading acquisition' In T.G. Waller and G. E. MacKinnon, (eds) *Reading Research: Advances in Theory and Practice* New York: Academic Press

Forsyth, D. (1988) 'An evaluation of an infant school screening instrument' Unpublished SEN dissertation Kingston-upon-Thames: Kingston Polytechnic

Frederickson, N., Frith, U. and Reason, R. (1997) *Phonological Assessment Battery (PhAB)* Windsor: NFER-Nelson ISBN 9780708707081/N0078

Frith, U. (Ed) (1980) *Cognitive Processes in Spelling* London: Academic Press ISBN 0-12-268-660-8

Frostig, M. and Horn, D. (1964) *The Frostig Programme for the Development of Visual Perception* Chicago: Follett

Galaburda, A. M. (1993) *Dyslexia and Development* Cambridge MA: Harvard University Press

Gathercole, S.E. (2008) 'Working memory in the classroom' *The Psychologist* 21 (5) 382-3850 ISSN 0952-8225

Gabor, G. (2007) 'An evaluation of the process and purpose towards setting up a dyslexia programme in an international school' Unpublished MA SpLD dissertation London: Middlesex University

Gabor, G. 2009 'Follow up report of the dyslexia programme results' Personal communication

Gelb, I.J. (1963) *A Study of Writing (2nd edition)* London: University of Chicago Press

Geschwind, N. (1979) 'Specialisations of the human brain' *Scientific American* 241 (3) 156-67 ISSN 0036 8733

Gillingham, A.M., Stillman, B.U. & Orton, S.T. (1940) *Remedial Training for Children with Specific Disability in Reading, Spelling and Penmanship* New York, Sackett and Williams

Gillingham, A., Stillman, B.U and Orton, S. T. (1956) *Remedial Training for Children with Specific Disability in Reading, Spelling and Penmanship* New York: Sackett and Williams

Golinkoff, R. M. (1978) 'Phonemics awareness and reading achievement' In F.R. Murray and J.J. Pikulski (eds) *The Acquisition of Reading* Baltimore: University Park Press

Goswami, U. 2008 'Language and reading difficulties' Keynote lecture at the International Schools Council Conference London, April

Gubbay, S. S. (1976) *The Clumsy Child* London: WH Saunders ISBN 0-7216-4340-X

Halonen, A,. Aunola, K., Ahonen, T., and Nurmi, J. (2006) 'The role of learning to read in the development of problem behaviour: A cross-lagged longitudinal study' *British Journal of Educational Psychology* 76 (3) 517-534 eISSN 2044-8279

Henderson, S.E. and Green, D (2001) 'Handwriting problems in children with Asperger Syndrome' *Handwriting Today* 2 65-71 ISBN 1-8728832-16-5

Hickey, K. (1977) *Dyslexia: A Language Training Course for Teachers and Learners* Wimbledon, 19 Woodside,

Holmes, B. (1994) 'Fast words speed past dyslexia' *New Scientist* 27th August 10 ISSN 0262 4079

Hornsby, B. and Shear, F. (1976) *Alpha to Omega 2nd edition* London: Heinemann

Hornsby, B. and Farrar, M. 1990 'Some effects of a dyslexia centred teaching programme' 173-95 In P. D. Pumfrey and C. D. Elliott (eds) *Children's Difficulties in Reading, Spelling and Writing* London: Falmer Press ISBN 1-85000-691-1

Hurry, J. Sylva, K. and Riley, S. (1996) 'An evaluation of a focused literacy teaching programme in Reception and Year 1' *British Educational Research Journal* 22 (5) 617-30 ISSN 0141-1926

Jarman, C. (1979) *The Development of Handwriting Skills* Oxford: Blackwell ISBN 0-631-19230-1

Jones, D. and Christensen, C. A. (1999) 'Relationship between automaticity in handwriting and students' ability to generate written text' *Journal of Educational Psychology* 91 (1) 44-9 eISSN 1939-2176

Kaplan, B.J. (2000) 'Atypical brain development' Paper presented at the 27th International Conference on Psychology. Stockholm

Kappers, E. J. (1990) 'Neuropsychological treatment of dyslexic children' *Euronews Dyslexia* 3 9-15

Koppitz, E. M. (1977) *The Visual Aural Digit Span Test* New York: Grune and Stratton ISBN 0-8089-1032-9

Kuczaj, S. A. (1979) 'Evidence for a language learning strategy: On the relative ease of acquisition of prefixes and suffixes' *Child Development* 50 1-13

Kutscher, M. L. (2005) *Kids in the Syndrome Mix of ADHD, LD, Asperger's Tourette's and more* London: Jessica Kingsley ISBN 978-1-84310-5

Laszlo, M., Bairstow, P. and Bartrip, P. (1988) ' A new approach to perceptuomotor dysfunction, previously called clumsiness' *Support for Learning* 3 33-40 eISSN 1467-9604

Liberman, I. J. (1973) 'Segmentation of the spoken word and reading acquisition' *Bulletin of the Orton Society* 23 365-77

Liberman, A. M., Shankweiler, D.P., Cooper, F. S., Studdert-Kennedy, M. (1967) 'Perception of the speech code' *Psychological Review* 74 (6) 431-61 eISSN 1939-1471

Low, G. (1990) 'Cursive makes a comeback' *Education* 6th April p 341

Manson, J. & Wendon, L. (1997) *Letterland: Early Years Handbook* London: Collins Educational

Marsh, G., Friedman, M. P., Welch, V. and Desberg, P. (1980) 'The development of strategies in spelling' 339-54 In U. Frith (ed) *Cognitive Processes in Spelling* London: Academic Press ISBN 0-12-268-660-8

McGhee, E. 2010 'An investigation of working memory training with a group of 17 dyslexics' Unpublished MA SEN Dissertation London; Middlesex University

McMahon, J. (1988) 'An analysis of early language difficulties in a sample of dyslexics' Unpublished B Ed Dissertation Report Kingston upon Thames: Kingston Polytechnic

Miles, T.R. (1993) *Dyslexia: The Pattern Of Difficulties 2nd edition* London: Whurr ISBN1-870332-39-3

Miles, T.R. and Miles, E. (1999) *Dyslexia 100 Years on 2nd edition* Buckingham: Open University Press ISBN 0-335-20034-6

Monroe, M. (1932) *Children Who Cannot Read* Chicago: Chicago University Press

Montgomery, D. (1984) 'Multisensory mouth training' Chapter 6 in L.L Cowdery and D. Montgomery et al op cit. Reprinted 1994 ISBN 1-900283-01-8

Montgomery, D. 1989 *Managing Behaviour Problems* Sevenoaks: Hodder and Stoughton ISBN 0-340-40832-4

Montgomery, D. (1995) 'Social abilities in highly able disabled learners and the consequences for remediation' pp 226-238 In M.W. Katzko & F.J. Monks *Nurturing Talent: Individual Needs and Social Abilities* Assen, The Netherlands: Van Gorcum ISBN 90-232-3033-7

Montgomery, D. (1997a) *Spelling: Remedial Strategies* London: Cassell 0-304-32974-6

Montgomery, D. (1997b) *Developmental Spelling: A Handbook* Maldon: Learning Difficulties Research Project ISBN 1-901686-00-0

Montgomery, D. (ed) (2000) *Able Underachievers* London: Whurr ISBN 1-86156-193-8

Montgomery, D. (2003) *Reversing Lower Attainment* London: David Fulton ISBN 1-85346-561-5

Montgomery, D. (2007) *Spelling, Handwriting and Dyslexia* London: Routledge ISBN 878-0-415-40925-4

Montgomery, D. (2008) 'Cohort analysis of writing in Year 7 after 2, 4, and 7 years of the National Literacy Strategy' *Support for Learning* 23 (1) 3-11 ISSN 0268-2141

Montgomery, D. (ed) (2009) *Able, Gifted and Talented Underachievers* Oxford: Wiley-Blackwell ISBN 978-0-470-55940-8

Montgomery, D. (2011a) *M3 Study Guide: Spelling and Handwriting Difficulties* Maldon, Essex: Learning Difficulties Research Project www.ldrp.org.uk ISBN 1-901686-00-4

Montgomery, D. (2011b) *M4 Study Guide: Dyslexic Difficulties* Maldon, Essex: Learning Difficulties Research Project www.ldrp.org.uk ISBN 1-901686-00-5

Montgomery, D. (2011c) *M6 Study Guide: Mathematical Difficulties and Dyscalculia* Maldon, Essex: Learning Difficulties Research Project www.ldrp.org.uk ISBN 1-901686-00-7

Montgomery, D. (2011d*) M22 Spelling Detective CPSS Dictionary* Maldon, Essex: Learning Difficulties Research Project www.ldrp.org.uk ISBN 1-901686-00-23

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Morley, K. (2001) 'Casework with an able dyslexic in Nairobi' *Educating Able Children* 5 (1) 27—30 ISSN

Morse, P (1991) "Cursive in Kingston-upon Thames' *Handwriting Review* 5 16-21 ISBN 1-872832-16

NICE Guidelines 2011 National Institute for Health and Clinical Excellence: Stroke rehabilitation guidelines www.nice.org.uk/nicemedia/live accessed 05/11/2011

Norrie, E. (1973) *Edith Norrie Letter Case Manual* London, Helen Arkell Centre (1993)

Norrie, E. (1917) *The Edith Norrie Letter Case* London, Word Blind Institute (1946), Reprinted Helen Arkell

O'Brien, K. (2004) 'An investigation of the use of CPSS as a means of remediating or correcting spelling errors' Unpublished MA SpLD dissertation London: Middlesex University

Parrant, H. (1989) 'An investigation of remedial approaches to children's spelling difficulties' Kingston Polytechnic, unpublished SEN dissertation

Pawley, J.(2007) 'Dyslexia – the Hidden Trigger?' Unpublished MA SpLD dissertation London: Middlesex University.

Pole, C. and Lampard, R. (2002) *Practical Social Investigations: Qualitative and Quantitative Methods in Social Research* Harlow, Essex: Pearson Educational ISBN 0-136-16848-5

Ridehalgh, N. (1999) 'A comparison of remediation programmes and analysis of their effectiveness on a sample of pupils diagnosed as dyslexic' Unpublished MA SpLD dissertation London: Middlesex University.

Rose, J. (2006) *Independent Review of the Teaching of Early Reading Final Report* www.standards.dfes.gov.uk/rosereview/interimreport.doc (Accessed 12/02/06)

Rumelhart, D. E. and McClelland, R. R. (eds) (1986) *Parallel Distributed Processing Volume 1 Foundations* Cambridge MA: MIT Press

Rubin, N. and Henderson, S. (1982) 'Two sides of the same coin: variations in teaching methods and failure to learn to write' *Special Education* 9 (4) 14-18 ISSN 0305-7526

Rutter, M. L., Tizard, J., & Whitmore, K. (eds) (1970) *Education, Health and Behaviour* London: Longman

Rutter, M. L., Caspi, A., Fergussen, D., Horwood, U., Goodman, R. Maughan, B. et al (2004) 'Sex differences in developmental reading disability' *Journal of the American Medical Association* 291 9 (16) 2007-12

Schonell, F. (1942) *Backwardness in Basic Subjects* Edinburgh: Oliver and Boyd ISBN 0-05-000344

Silverman, L. K. (2004) 'Poor handwriting: A major cause of underachievement' http://www.visualspatial.org/Publications/Article%20List/Poor_Handwriting.htmAccess12/03/2004

Singleton, C. (2006) 'Dyslexia and youth offending' 117-121 in S. Tresman and S. Cooke (eds) *The Dyslexia Handbook* Reading, Berks: The British Dyslexia Association

Smith, P. A. P. and Marx, R. W. (1972) ' Some cautions on the use of the Frostig test' *Journal of Learning Disabilities* 5 (6) 357-62 http://ldx.sagepub.com

Snow, R.E. (1973) 'Theory construction for research on teaching' 77-112 in R..M.W. Travers (Ed) *Second Handbook of Research on Teaching* New York: Rand McNally Library OF Congress Card No. 72-6922

Snowling, M.J. 2000 *Dyslexia 2nd edition* Oxford: Blackwell ISBN 0-631-20574-8

Snowling, M. J. and Stackhouse, J. and Rack, J. (1986) 'Phonological dyslexia and dysgraphia – a developmental analysis' *Cognitive Neuropsychology* 13 303-39 eISSN 1464-0627

Springer, S. P. and Deutsch, G. 2003 *Left Brain Right Brain: Perspectives from Neuroscience 5th edition* New York: W. H. Freeman and Co. ISBN 0-7167-3111-8

Stainthorp, R., Henderson, S., Barnett, A. and Scheib, B. (2001) Handwriting policy and practice in primary schools' Paper presented at the British Psychological Society Education and Developmental Sections Joint Annual Conference September, England: Worcester.

Stillman, B. (1940) 'On penmanship' In A. Gillingham , B. Stillman, and S.T. Orton, . op. cit

Tallal, P. (1994) 'New clue to cause of dyslexia seen in mishearing of fast sounds. An interview with Dr Tallal' by S. Blakeslee, *New York Times* 16th August 24

Tallal, P. (1980) 'Auditory temporal perception, phonics, and reading disabilities in children' *Brain and Language* 9 182-198 ISSN 0093-934X

Taylor L. (2007) 'The second core deficit. What is the effect of early intervention? Are a lack of automaticity and fluency attributable solely to dyslexic pupils? Unpublished dissertation London: Middlesex University

Treiman, R. (1993) *Beginning to Spell* Oxford: Oxford University Press

Tunmer, W. & Nesdale, A. (1982). The effects of digraphs and pseudowords on phonemic segmentation in young children. *Applied Psycholinguistics*, 3, 299-311

Vellutino, F.R. (1979) *Dyslexia: Theory and Research* London, M.I.T. Press

Vellutino, F.R. (1987) 'Dyslexia' *Scientific American* 256 (3) 20-27 ISSN 0036 8733

Webb, M. (2000) 'An evaluation of the SEN provision to improve literacy skills of Year 9 students at Nfields' Unpublished MA SpLD dissertation London: Middlesex University

Wechsler, D. (1997) *Wechsler Intelligence Scale for Children (WISC III)*. San Antonio, TX: The Psychological Corporation

Wedell, K. (1973) *Learning and Perceptuomotor Difficulties in Children* New York: Wiley

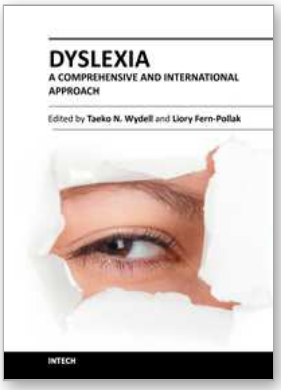
WISC - 1V (2006) *Wechsler Intelligence Scale for Children - 1V* London: Psychological Corporation ISBN 978- 0-749123-65-8

Witelson, S. F. (1977) 'Developmental dyslexia, two right hemispheres and one left' *Science* 195 309-11

Wolf, M. and Bowers, P. 1999 'The double deficit hypothesis for developmental dyslexia' *Journal of Educational Psychology* 9 (3) 1-24 eISSN 1939-2176

Wren, S. (2005) 'The double deficit hypothesis for decoding fluency' http://www.balancedreading.com/doubledeficit.html (Accessed 1/8/2010)

Ziviano, J. and Watson-Will, A. (1998) 'Writing speed and legibility of 7-14 year old school students using modern cursive script' *Australian Occupational Therapy Journal* 45 59-64 eISSN 1440-1630



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This book brings together dyslexia research from different perspectives and from different parts of the world, with the aim of providing a valuable source of information to medical professionals specializing in paediatrics, audiology, psychiatry and neurology as well as general practitioners, to psychologists who specialise in developmental psychology, clinical psychology or educational psychology, to other professions such as school health professionals and educators, and to those who may be interested in research into developmental dyslexia. It provides a comprehensive overview of Developmental Dyslexia, its clinical presentation, pathophysiology and epidemiology, as well as detailed descriptions of particular aspects of the condition. It covers all aspects of the field from underlying aetiology to currently available, routinely used diagnostic tests and intervention strategies, and addresses important social, cultural and quality of life issues.

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