

Report on Handwriting and Achievement for Potential Plus UK

Introduction

For some considerable time handwriting difficulties have been identified as one of the major causes of underachievement among gifted pupils (Whitmore, 1982; Silverman, 1989, 2002; Montgomery, 1997, 2015).

However such writing difficulties are not limited to the gifted. Roaf (1998) found that pupils in secondary schools who were writing at a speed slower than 25 words per minute in a 10 minute, free writing test were underachieving in all areas of the curriculum. Poor handwriting was also associated with lower perceptions of self worth.

Bravar (2005) found that 70 per cent of Italian children referred for underachievement had writing difficulties. Of these, 47 per cent had poor handwriting and the writing of 23 per cent was illegible but only 6 per cent had actually been referred for their writing problems.

With the arrival of computers and laptops some people suggest that handwriting is no longer needed but recent research using fMRI scanning has shown that handwriting is much more important than has previously been thought. For example Berninger (2015) followed children in grades two through five and her study showed that printing, cursive writing, and typing on a keyboard were all associated with distinct and separate brain areas.

When the children composed text by hand, they not only consistently produced more words more quickly than they did on a keyboard but expressed more ideas. In the oldest subjects brain imaging suggested that the connection between writing and idea generation went even further. When the children were asked to come up with ideas for a composition, the ones with better handwriting exhibited greater neural activation in areas associated with working memory and increased overall activation in the reading and writing networks.

Mueller and Oppenheimer (2014) found that in both laboratory settings and real-world classrooms, students learned better when they took notes by hand than when they typed on a keyboard. This suggests that writing by hand allows pupils and students to process a lesson or lecture content and reframe it — a process of reflection and manipulation that can lead to better understanding and memory encoding than keyboarding or cutting and pasting.

Preliterate five-year old children printed, typed, or traced letters and shapes, then were shown images of these stimuli while undergoing fMRI scanning (James and Engelhardt, 2012). A previously documented “reading circuit” was recruited during letter perception only after handwriting not after typing or tracing experiences. The researchers found that the initial duplication process mattered a great deal. When children had drawn a letter freehand, they exhibited increased activity in three areas of the brain that are activated in

adults when they read and write: the left fusiform gyrus, the inferior frontal gyrus and the posterior parietal cortex.

By contrast, children who typed or traced the letter or shape showed no such effects. The researchers attributed the differences to the messiness inherent in free-form handwriting: Not only must we first plan and execute the action in a way that is not required when we have a traceable outline, but we are also likely to produce a result that is highly variable. The variability may itself be a learning tool for different forms of the same letter. Such evidence-based research has implications for the early years writing and reading curriculum.

Cohort analysis of pupils in Year 7 in three English non-selective state schools found that 32 per cent of the 536 pupils had handwriting difficulties of some kind that would affect their school achievement (Montgomery 2008). Only one pupil in 536 was writing at a speed of 25 words per minute in Year 7 in the 20-minute test. 1.5% of pupils were writing at a speed of 15 to 20 w.p.m. Girls were writing 2.5 words per minute faster than boys at this age.

In these same Year 7 samples spelling errors were also collected. The percentage of dyslexics in the general school population is found to be 10 per cent (British Dyslexia Association, 2016) with 4 per cent in the severe category. The 4 % of scripts with the most spelling errors were analysed and it was found that the error rate was 15 - 20 misspellings or more words in the 22 'worst' scripts. At this age pupils are expected to make no more than 5 misspellings per 100 words (HMCI, 2001). An error rate of 10 words per 100 words put these pupils in the 'at risk' category for dyslexia.

The nature of the spelling errors followed a normal developmental error pattern typical of younger pupils although at first many might be termed 'bizarre' for the Year 7 age group. Those with the severe spelling problems wrote at a speed 2 words slower per minute than the rest of the cohort. Presumably because more cognitive resource was being required to generate the spellings and detracted from the automaticity of the handwriting and composition. Automaticity in handwriting is related strongly to success in composition according to Medwell and Wray (2014) and Berninger (2004).

Pre-term children have also been found to be a population at risk from handwriting difficulties. Feder and Majnemer et al (2005) found that full term controls wrote at a higher speed and with greater legibility at 6/7 years than pre-term children.

In a survey of writing speed in words per minute using a 20-minute handwriting test Allcock (2001) found the mean writing speeds of pupils in Years 7 to 10 were approximately one word greater than their chronological ages. She found pupils slowed in the 3rd five minutes and speeded up again in the final five.

Stainthorp and Rauf (2009) found similar differences in the poorer skills of boys than girls on all subtests of DASH (Developmental Assessment of Handwriting Speed, Barnett and Henderson et al 2008). The free handwriting speeds in the 10-minute test in words

per minute were: Year 4 10.62 girls, 9.06 boys (N=168); Year 5 13.01 girls, 10.28 boys (N= 177); Year 6 15.31 girls, 13.15 boys (N=76). The shorter 10-minute test appears to inflate the scores by about 2 words per minute per year over the 20 minute test and schools seem more amenable to using it than the 15 or 20 minute tests which make fatigue and coordination difficulties more apparent.

Socio-economic status also appears to play a role in handwriting skill. Three schools in different catchment areas participated in Year 5 using a 15-minute free handwriting test (Montgomery, 2015) and the results were i) Church school - 10.04 w.p.m. (N=85) ii) Rural school – 8.05 w.p.m. (N=60) iii) Coastal school – 7.81 (N=52). The spelling error means respectively were i) 8.84 ii) 9.56 iii) 10.45. Girls wrote faster than boys by about 2 words per minute. Again the results were slower than for the DASH samples in the 10-minute test but indicated that children from poorer catchment areas and economic backgrounds wrote more slowly than others. Their spelling error numbers increased with lower SES and their writing speed decreased.

Research by Marin and La Voie et al (2012) showed that those taught cursive from the outset made more progress in speedy writing of words followed by semi-joined and slowest were those taught print. They advocated teaching cursive from the outset as switching was too hard for most children. Other researchers specifically recommend **not** allowing children to trace letters because doing so delays memorisation of letter-forms (Overvelde & Hulstijn, 2012).

Not tracing or copying run against the custom and practice in most English Reception classrooms but evidence from the 16 schools in the Kingston cursive project (Low 1991) and other such initiatives in Kent, Portsmouth and Avon support these findings. The results have implications for current early years handwriting and spelling teaching and for supplementary learning support at the later stages.

The Sutton Trust research (Jerrim, 2013) found that by the end of the Reception year children from poor homes were 11.5 months behind middle income and rich peers in reading.

Case studies (Montgomery 2015) of 177 Reception class children's writing in four different schools illustrated the effects of different teaching methods and some of their shortcomings. After one month in Reception the children did a copy writing then a free writing task for 10 minutes They were followed up and five months later wrote another story or news for 10 minutes and then wrote again for 10 minutes after entry into Year two. The copy writing and free writing level scores showed the same effects of socioeconomic status on literacy achievement and teaching methods. By the end of the first 5 months the poorest children were already 5 months behind the rest and had not caught up when they were retested in Year 2.

The research with the Year 7 cohorts showed that one third of pupils at that age had handwriting difficulties that lowered their potential achievements. Just under one third had spelling difficulties and some had both. Although misspelling was often commented

upon and help might be given it was rare to find any intervention to give help with handwriting

Three of the primary schools in the Reception class studies were feeder schools into the large comprehensive where 32% had handwriting difficulties and 18.6% were in the dyslexic 'at risk' zone. The correlation of the early writing tasks in Reception with the results in Year 2 was 0.53 to +0.58 and +0.41 in the less orderly classroom

Because dyslexia is both a reading and a spelling problem and a spelling problem without reading difficulties is one of its outcomes it is possible for a free writing test to capture both and accounts for the higher incidence of literacy problems in the cohort studies above in contrast to the 10 per cent cited by the BDA. The ratio of boys to girls with problems is also different and is 1.2 to 1 in contrast to 4 to 1 boys to girls traditionally referred for dyslexia problems. The smaller ratio of boys to girls is endorsed in community research by Rutter and Caspi et al (2004).

From all of these studies a range of handwriting difficulties emerged. These were related to speed, style, fluency, legibility, form and coordination skills and secondary problems arose from spelling difficulties. The researches had shown that the higher achievers in terms of school performance gained the higher grades and had fewer writing problems than the rest. These pupils were likely to come from higher income groups and supportive families.

The question was raised whether a self-selected group with high learning potential such as members of Potential Plus UK some of whom were also members of Mensa and others with measured IQs of 145 and above, exhibited any of the handwriting and spelling difficulties previously observed in the general school samples. Could any estimate be reached of the numbers of such cases? It would be a tragedy if pupils with extreme giftedness were denied opportunities for achievement because of unrecognized difficulties in writing.

Potential Plus UK was approached to invite their members to help in a handwriting and achievement study. This was designed to find out the nature of any problems in writing and spelling in such a group with High Learning Potential (HLP) and to suggest some interventions that might help or bring leaning support. Indeed could a small 10-minute sample of written work serve these several purposes?

Method

A circular was sent to members by the Chief Executive of PPUK to invite them as families to participate in the project. It involved free writing for 10 minutes on any subject of interest (photograph or hard copy) and recording, sex (M/F), handedness (R/L) and pencil or pen hold (tripod, rigid tripod, stab, or other with photograph).

30 families participated in the Handwriting Achievement Project. There were 43 school age pupils and 7 adults aged 35 and above contributing handwriting samples. There were 37 primary school age pupils in Reception to Year 6; 3 in Year 7; 2 in Year 8 and one in Year 9. The statistical analysis focused upon the 40 pupils in Reception to Year 7.

8 girls and 32 boys took part in the study. 8 pupils (16 %) were left-handed. This is above the national average which is 12 %.

The analysis of each script was upon a) six handwriting factors: speed, style, form, fluency, legibility and coordination difficulties and b) the number and nature of any spelling errors.

In each case the handwriting and spelling skills were detailed in a report and where relevant suggestions for intervention were provided with the opportunity for feedback and further follow-up. Most case reports were from 4 to 9 pages in length.

This research is thus not based on a random sample but upon the willingness of parents in Potential Plus UK to volunteer their time and their children's handwriting to the project. It was therefore likely that those concerned about their child's achievement and / or handwriting would put forward the majority of samples. Of the 1500 or so members in PPUK the assumption was that 1,000 might be available to participate but most who would be likely to have some concerns. In such a scenario 4% was the participation rate and as will be seen most of them did have problems.

Results

The handwriting of the 40 pupils in the age range from Reception to Year 7 are summarised and analysed for this report.

Of the 40 pupils only 8 had no identifiable spelling or speed and coordination handwriting problems except that in 7 cases suggestions were made that would improve legibility.

'**Dyslexics**' were those who made more than 10 misspellings per 100 words after the Reception year and wrote no decipherable words in the Reception Year.

Speed problems were identified as cases where rate per minute was lower than the mean for the Year group. This takes into account that the more able should be writing faster than other pupils.

Co ordination difficulties were identified by reference to 7 handwriting co ordination criteria (Montgomery, 2015).

Legibility was not scored but interventions were suggested as appropriate and related to 'body' size, ascenders and descenders, use of lines, letter formation and word space.

Of the whole group of 40:

- 8 were diagnosed with dyslexia (16%), only 2 had a formal diagnosis
- 4 had dyslexia and speed problems (50% of the dyslexics)
- 5 dyslexics had co ordination difficulties (12.5% of the dyslexics)
- 13 had significantly slow speed, 25 per cent or more slower than the mean. (26%)
- 22 had handwriting /coordination difficulties (55%)
- 27 had some form of handwriting difficulty in speed or coordination (67.5%)

- 8 had both speed and coordination problems (16%)
- 28 had a speed 30 per cent or more slower than might be predicted from their high ability (70%).
- 32 of the group of 40 had a problem that would be detrimental to potential high achievement in school (80%).
- 7 used the more problematic quadruped or thumb over grip (17.5%), not the usual tripod or rigid tripod grip.
- Other problems such as weak grip and too firm a grip had to be inferred from pressure or lack of it on the scripts and reference to any coloured photographs.
- Several adults and children reported pain in their writing hands after five minutes of writing although this information was not specifically requested.

Alston (1993) found that 40% of her samples complained of pain when writing at length and avoided it whenever possible.

Conclusions and discussion

The conclusion from this sample is that in the majority of cases potential achievement was undermined by difficulties in handwriting and / or spelling. Handwriting difficulties were in the majority, that is, in two thirds of the sample.

Although these results cannot be generalised to all gifted pupils what it does reveal is that a large number of cases of potential underachievement are going unobserved in schools because they appear in a neglected category of need, that is the handwriting difficulties 'in full sight'.

The distress that this creates in many such cases makes them vulnerable to nervous illness and withdrawal from school such is the disparity between their high ability and their writing accomplishment and its reception by the their teachers.

The advantage is that the interventions have shown that most of the handwriting difficulties could be overcome if the intervention takes place precisely and preferably in Reception and Years 1 and 2. It would include insisting on lines for writing on in Reception, teaching cursive from the outset by joining letters with the ligatures already being made, and giving double lines and legibility training at intervals in Years 1 and 2. Prior training in 'motricity' (Kent, 2014) for all preschool children and a continuation into Reception and beyond for all those who need it as in Motorway ABC (Upton and Duckett et al 2008) .

In the cases where there are severe handwriting difficulties, word processing will aid legibility but not necessarily speed and so careful monitoring is needed to check to find if an amanuensis is appropriate. The pupils with significant writing difficulties must be allowed to use their personal laptops not have to go and seek the key for the computer room to collect and use the school laptops. When a scribe is recommended it should be an early intervention and practice must precede any test performance. Voice activation systems may eventually become economically viable for everyday use.

In the dyslexia cases, all were in the second level dyslexia stage of having orthographic rather than phonological issues. This is where the pupil is often able to read at grade level but spelling is very poor for age and ability. This is also the residual problem when dyslexics have been through a remedial programme but are still left with spelling problems. In the case of some gifted pupils who have never had a reading problem or one that is recognised as such because they function at grade level, not many years above as most gifted pupils do. A very good visual memory, clever tactics, or sheer determination can enable others to learn to read because it is easier than spelling. It is a recognition skill whereas recalling all the letters in words in the correct spelling order can be much more problematic.

The free writing sample can reveal the underlying spelling problems that even a spelling test may not. The cleverest of all gifted pupils will contain their test stories to the use of words that they know they can spell but this slows down their writing speed. In a speed test for handwriting with no need to worry about spelling more is revealed.

The misspellings in the samples were addressed with interventions from 12 Cognitive Process Spelling Strategies (Montgomery, 2007) to correct the lexicon and motor retraining to correct old misspellings. The parents trying these out found the children very receptive and able to use them to generalise to a whole range of new words,

Schools were offering phonics, analogy tactics and rote learning strategies through regular spelling tests that were not sufficient for the task. Every teacher could become knowledgeable about these interventions and use the 12 CPSS and add a special word bank (15 Spells) for their subject area that would reveal further strategies to all the pupils. Earlier research had demonstrated the effectiveness of their use as mini-lessons in classrooms and tutorial groups reducing misspelling by 50 per cent in a term (Montgomery 1997, 2007).

Overall the free writing test at any age can reveal both explicit and hidden learning difficulties. Within the sample it also alerted the analyst to potential problems of bullying, perfectionism, preoccupations with violence, Asperger type rigidities and emotional fragility. All of which could be followed up or a watching brief held by parents in case any difficulties did arise.

It would appear from the Potential Plus UK study that sampling handwriting at regular intervals in schools and giving teachers the tools to analyse it could reveal a range of significant learning difficulties across the ability range. It would offer more concrete individual documentation of literacy progress than many formal tests. It would also show hard evidence of the effectiveness or otherwise of any intervention.

A more balanced approach to literacy teaching would then be available to supplement the present focus upon reading, with copy writing and tracing in Reception and little handwriting tuition thereafter. Specific handwriting and spelling tuition would appear to be very much neglected areas in many classrooms at all levels.

What is probably needed now is a formal research project that implements the practices identified in this study by incorporating them into Early Years practice in a set of Project schools. Cohort data could be collected in 10-minute handwriting samples at the beginning end of each year. This can then be analysed and compared with data from control group schools to determine relative effectiveness.

The advantage is that such data is very easy to collect and would not involve teachers in any extra time than normal teaching, as writing is part of pupil's daily work.

Other research could begin at year 7 to show the effects of intervention there to remediate the effects of current practice and once again data could be collected by 10-minute free writing samples.

It would appear that the practices in these literacy areas are based heavily upon custom and practice and 'good' practice but not much upon evidence-based practice and this needs to be remedied.

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