

How much does style matter? Investigating legibility and speed of writing in Year 2 children

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Abstract

Efficient transcription skills underpin the writing process and have been shown to explain variance in both quality and quantity of written composition. Although there is broad consensus that the development of legible handwriting produced at sufficient speed is a priority in the early years of school, there is much debate about how this is best achieved. The present study compared the performance of two groups of Year 2 pupils, with contrasting instructional regimes and experience, across a range of tasks assessing writing speed and legibility, and spelling. Participants from School M ($n=74$) had initially been taught to form individual (manuscript) letters and had only been introduced to joining at the end of Year 1; while participants from School CC ($n=39$) had been taught to form letters with entry strokes from the baseline since school-entry and a continuous cursive style had been promoted throughout. Results showed that participants from School CC were more productive than those from School M; however, participants at School M produced text that was more legible. The evidence regarding the merits of particular regimes and styles is not conclusive, nor is a secure relationship between handwriting style and spelling established. However, for both settings, findings provide useful implications for practice.

1. Introduction

In spite of the widespread availability of technology, the development of legible and fluent handwriting remains a priority for primary-age pupils in the UK. Written work that is effortful to read has been found to be judged more harshly in terms of content (Graham, Harris, & Herbert, 2011) and handwriting difficulties have been linked to underachievement across the curriculum in later years (Feder & Majnemer, 2007).

Orthographic knowledge (letter forms), phonic knowledge (letter names and related sounds) and grapho-motor skills (physical output) are drawn upon to produce handwriting. The role of handwriting is well represented by Berninger and Amtmann's (2003) 'simple view of writing' (SVoW). Here, handwriting is positioned as a transcription skill, along with spelling, which supports the text generation and executive processes (planning and reviewing text) engaged while writing. Broad consensus now exists that automaticity in transcription skills is critical for text production and text quality (Christensen, 2009; Olive & Kellogg, 2002; Santangelo & Graham, 2016). Significant correlations between handwriting fluency and both compositional quality and fluency, as well as spelling accuracy and compositional fluency, have been found for primary aged pupils (Graham, Berninger, Abbott, Abbott & Whitaker, 1997). The complex relationship between the two transcription skills themselves has also been scrutinised. Research has demonstrated that spelling ability predicts variance in overall written production in students with and without dyslexia (Sumner, Connelly & Barnett, 2014) and that orthographic coding is a key predictor of variance in handwriting (Berninger, 2009).

In addition to considering how spelling ability interacts with handwriting, it is important to understand the role of instruction. Handwriting instruction has a positive effect on compositional quality and fluency (Christensen, 2009; Jones & Christensen, 1999). The first years of schooling have been highlighted as critical (Bara & Morin, 2013; Sassoon, 2003), with explicit teaching and frequent practice opportunities shown to be most impactful (Hoy, Egan, & Feder, 2011; Santangelo & Graham, 2016). Teaching should be structured and systematic, and sessions should be short but frequent (Christensen, 2009). Although handwriting proficiency clearly relies in part upon fine motor skill, teaching time should be dedicated to refining correct letter formation, and later joins (Hoy et al., 2001). Practices which encourage pupils to retrieve letter forms from memory have been found to be particularly effective (Berninger et al., 1997).

In the most recent National Curriculum (Department for Education [DfE], 2013), only broad parameters for the teaching of handwriting are provided. No particular style is stipulated, although broad steps are outlined, and the joining of letters suggested from Year 2 (age 6-7). At the end of Year 2, statutory assessment for the *expected* standard in writing (Standards and Testing Agency [STA], 2018) demands that pupils "form capital letters and digits of the correct size, orientation and

relationship to one another and to lower-case letters” and “use spacing between words that reflects the size of the letters” (p.7). It is only for the *greater depth* standard that joining is mentioned.

Although research points to legibility and speed of handwriting being most important, many practitioners have strong feelings about the relative merits of different handwriting regimes. For the purpose of this paper, *continuous cursive* writing describes a style characterised by continuous joining and few pen lifts, while *manuscript* writing describes a style where individual letters are formed separately and left un-joined. Manuscript letters mirror those observed in text and the environment as children acquire essential alphabetic knowledge (Myers, 1983). The letter shapes are simpler and relatively stable (Bara & Morin, 2013) and therefore, children are likely to secure these more quickly. However, many schools teach continuous cursive handwriting from the reception year (ages 4-5), and in some cases from nursery (ages 3-4), with all individual letters taught with both *entry strokes* from the baseline and *exit strokes*, and the joining of letters promoted at the earliest opportunity. Today, very few UK schools teach a traditional manuscript style; although letters are commonly taught as individual forms, these are explicitly developed with an exit stroke to facilitate later joining (Sassoon, 2003).

Another source of debate is *when* pupils should be encouraged to join. Those explicitly promoting continuous cursive writing on school-entry maintain that repeated activation of kinaesthetic and visual memory of letter combinations supports the development of accurate spelling as well as fluent handwriting (Peters & Smith, 1993). There is little empirical evidence to support this rationale, particularly with very young children (Christensen, 2009). Continuous cursive handwriting is sometimes favoured for dyslexic learners; however, there is limited evidence to support this approach and advocates, such as Wolf (2011), are clear that individual letters should be mastered first, much as the curriculum suggests. Indeed, some have suggested that cursive forms, with high and sudden curvatures, are more complex to reproduce in a single spontaneous movement (Meulenbroek & Van Galen, 1990) and this may impact on writing speed. The ability to reproduce oblique lines, inherent in many cursive letter forms through diagonal entry strokes, emerges between 4 and 5 years old (Beery & Beery, 2010) and any pupils who have not developed this movement may find the formation of cursive letter forms challenging (Feder & Majnemer, 2007). The first year of instruction has been cited as key (Sassoon, 2003) and weak automatization at this critical stage could cause problems later on (Feder & Majnemer, 2007).

There is mixed evidence regarding the relative merits of different handwriting styles in terms of legibility and speed. Bara and Morin (2013), working with French and Canadian pupils, found the legibility of cursive writing to be superior to manuscript. However, results from the same study showed that it was also slower. Morin, Lavoie and Montesinos (2012) proposed that weaker automaticity in letter production, where more than one style had been taught (manuscript, then

cursive), impacted on writing speed. Others have promoted a mixed-style, with some letters joined and some left un-joined, as advantageous in terms of speed and legibility (Graham, Weintraub, & Berninger, 1998). With mixed evidence in the literature as to the impact of particular instructional methods on speed and legibility, the present study sought to establish if there was a relationship between these variables. With some practitioners suggesting improved automaticity of spelling as a benefit of promoting a cursive script, but with little empirical evidence for this, the study sought to clarify whether there was any relationship between handwriting style and spelling ability.

The present study explored the relationship between the handwriting style taught on school-entry (ages 4-5) and speed and legibility of handwriting in Year 2 (ages 6-7). The handwriting of pupils who were first taught individual letters and introduced to joining later, was compared with the handwriting of those who had been explicitly taught continuous cursive handwriting from school-entry, in order to investigate the impact of contrasting instructional methods. Three research questions were explored:

1. Does the handwriting style taught from school-entry affect speed of handwriting in Year 2?
2. Does the handwriting style taught from school-entry affect the proportion of transcription errors (including legibility and spelling accuracy) in Year 2?
3. Are spelling and handwriting efficiency (i.e., speed and legibility) related?

2. Methods

2.1 Participants

Two cohorts of Year 2 children were targeted from 3-form entry infant schools in the same area in the South East of England. One school taught manuscript handwriting from school-entry and pupils were then introduced to joining only at the end of Year 1, with entry strokes for individual letters not being taught (hereafter referred to as the manuscript group; M); and the other school where continuous cursive handwriting is routinely taught from school-entry (hereafter referred to as the continuous cursive group; CC). Participants were required to have been on the school's roll since the beginning of the reception year. Those who arrived after this time were excluded in order to minimise the influence of instructional methods from other settings. It was also decided that participants should have achieved at least 2 (*expected* standard) for *early learning goal 4 (ELG4) moving and handling*, at the end of the early years foundation stage (EYFS; STA, 2016). This step limited the impact of those whose skills were judged as *emerging* (1) at that point and whose fine motor skill development may remain out of step with their peers. The final sample comprised 74 children in the M group (31 male) and 39 children in the CC group (21 male). A Mann Whitney U test revealed no significant group differences for age, $U = 1376.00$, $Z = -.41$, $p = .69$ (M: mean age = 83.91 months, $SD = 3.49$; CC: mean age = 83.56, $SD = 3.45$).

Teachers reported the nature of handwriting practice in their school. A consistent approach was taken by staff within each school. The length of practice sessions was similar across schools (20 mins). Of note, however, there was a difference in the time allocated to the teaching of handwriting. School M reported allocating four sessions a week in all year groups, while School CC confirmed one session each week (Year 2).

Ethical approval was obtained from University College London, Institute of Education. Informed consent was sought from parents/carers ahead of the study. On the morning of the tasks, the researcher explained the project to each class and all participants affirmed verbally that they were happy to continue.

2.2 Measures

Spelling ability. The Helen Arkell Spelling Test (HAST-2; Caplan, Bark, & McLean, 2012), a dictated spelling test, was conducted with both groups and a standard score generated for each participant.

Handwriting tasks. The alphabet task from the Detailed Assessment of Speed of Handwriting (DASH; Barnett, Henderson, Scheib, & Schulz, 2007) was used in order to assess participants' automaticity of letter production. Speed of production was noted (letters per minute). The 2-minute copy fast task from the DASH was also administered. The nature of this timed copying task facilitated the assessment of participants' handwriting with the demands of spelling, punctuation, grammar and composition reduced. Speed of production was noted (words per minute).

Writing task. The 5-minute writing task from the Curriculum Based Measure–Writing (CBM-W; Dockrell, Connelly, Walter, & Critten, 2016) was administered, which has a narrative prompt ('One day I had the best day at school...'). Writing samples were analysed in terms of speed (words per minute), spelling accuracy (%) and legibility (%). Samples were also scored against the five components of the *Handwriting Legibility Scale* (HLS; Barnett, Prunty, & Rosenblum, 2018) and the predominant writing style classified according to the same criteria used by Bara and Morin (2013): (a) mixed, mostly cursive; (b) mixed, mostly manuscript; (c) cursive, or (d) manuscript.

2.3 Data analysis

Participants' writing samples were scrutinised and experimental measures scored. The written tasks were split between the two researchers for assessment against the HLS in order to enhance inter-rater reliability. Data was analysed using SPSS. Tests of normality were initially conducted to determine which statistical tests would be most appropriate for group comparisons. Correlational analyses were also conducted to examine the relationship between spelling and handwriting variables.

3. Results

Background information

A one-way analysis of variance (ANOVA) revealed no group differences in spelling ability, as measured by the HAST-2, $F(1,111) = .62, p = .43$ (M: mean = 108.35, SD = 14.04; CC: mean = 110.44, SD = 12.14).

Although the M group had initially learned individual letter forms, by Year 2 the majority of pupils in both groups were using a continuous cursive style, as shown in Table 1.

Table 1. Breakdown of current handwriting styles for each group

Style	M ($n=74$)	CC ($n=39$)
	% of cohort	% of cohort
Continuous cursive	74.3%	79.5%
Manuscript	14.9%	5.1%
Mixed cursive	6.8%	10.3%
Mixed manuscript	4.1%	5.1%

RQ1: Does the handwriting style taught in school-entry affect speed of handwriting in Year 2?

Table 2 shows the means and standard deviations for the productivity and speed calculations across the three writing tasks. Mann Whitney U tests revealed no significant group differences on the number of letters produced in the alphabet task, $U = 1409.00, Z = -.21, p = .84$, nor for the copy fast words per minute, $U = 1157.50, Z = -1.74, p = .08$. In contrast, one way ANOVAs revealed significant group differences for the copy fast total word count, $F(1,111) = 4.31, p = .04$, CBM-W total word count, $F(1,111) = 22.73, p < .001$, and CBM-W words per minute, $F(1,111) = 22.74, p < .001$. In both the free-writing task and the copy fast task, CC participants wrote significantly more than M participants.

Table 2. Mean scores and standard deviations (SD) for writing speed and productivity

	M ($n=74$)	CC ($n=39$)
	Mean (SD)	Mean (SD)
Alphabet (lpm)	21.93 (10.97)	21.38 (6.77)
Copy Fast (total words)*	15.64 (5.11)	17.74 (5.16)
Copy Fast (wpm)	8.07 (2.57)	9.08 (2.66)
CBM-W (total words)**	25.92 (11.87)	38.15 (14.85)
CBM-W (wpm)**	5.18 (2.38)	7.63 (2.97)

* $p < .05$; ** $p < .001$

RQ2: Does the handwriting style taught in school-entry affect transcription errors (including legibility and spelling) in Year 2?

Tables 3 and 4 present the results for the legibility and spelling accuracy measures from the copying and writing tasks. Mann Whitney U tests revealed no group difference for spelling accuracy on the CBM-W task, $U = 1287.00$, $Z = -.94$, $p = .35$, nor for the copy fast task, $U = 1340.50$, $Z = -.62$, $p = .54$; but significant group differences were found for the count of legible words for the copy fast task, $U = 1060.00$, $Z = -2.75$, $p = .006$, and the CBM-W task, $U = 673.50$, $Z = -5.06$, $p < .001$. These group differences demonstrate that the M group produced more legible words than the CC group. One way ANOVAs for the HLS measures in Table 3 revealed significant group differences for the copy fast task, $F(1,111) = 22.85$, $p < .001$, and the CBM-W, $F(1,111) = 14.51$, $p < .001$. The CC group were found to have significantly higher scores than the M group. This indicates poorer legibility and corroborates the measure of legible words (%) with group M having higher percentages of legible words than group CC in both tasks.

Table 3. Mean scores and standard deviations (SD) for legibility and spelling

	M ($n=74$)	CC ($n=39$)
	Mean (SD)	Mean (SD)
Copy Fast (% of legible words)*	97.20 (5.26)	93.00 (9.25)
Copy Fast (% spelling accuracy)	95.69 (6.42)	89.51 (11.24)
Copy Fast (HLS overall score ^a)**	8.41 (1.90)	10.33 (2.24)
CBM-W (% of legible words)**	96.95 (8.19)	91.33 (9.91)
CBM-W (% spelling accuracy)	79.74 (14.31)	78.92 (12.17)
CBM-W (HLS overall score ^a)**	9.78 (2.62)	11.71 (2.57)

^alower HLS scores indicate better legibility; * $p < .05$; ** $p < .001$

Mann Whitney U tests for the individual components of the HLS revealed group differences for legibility, $U = 989.50$, $Z = -2.94$, $p = .003$, effort, $U = 928.50$, $Z = -3.40$, $p = .001$, letter formation, $U = 947.00$, $Z = -3.31$, $p = .001$, and alterations, $U = 1070.00$, $Z = -2.62$, $p = .009$. School CC scored significantly higher on each of these measures again indicating poorer legibility (see Table 4). No group differences were found for layout, $U = 1216.00$, $Z = -1.51$, $p = .13$.

Table 4. Breakdown of HLS scores for CBM-W task

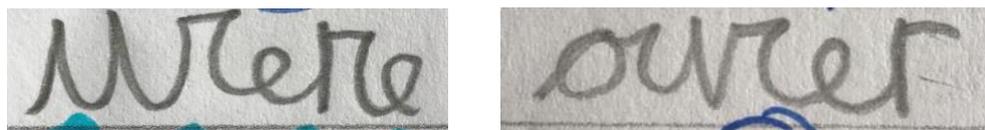
HLS components ^a	M ($n=74$)	CC ($n=39$)
	Mean (SD)	Mean (SD)
Legibility*	1.95 (.87)	2.41 (.82)
Effort*	1.97 (.94)	2.44 (.68)
Layout	2.24 (.74)	2.49 (.76)

Letter Formation*	2.24 (.64)	2.74 (.78)
Alterations*	1.35 (.53)	1.61 (.63)

^alower HLS scores indicate better performance; * $p < .05$; ** $p < .001$

Qualitative analysis of writing samples from both groups are also included here. Figure 1 shows that, for a small group of CC pupils, extra strokes or forms mid-word, as they returned to the baseline, impacted on legibility.

Figure 1. Examples of CC pupils returning to the baseline (*were* and *over*)



Examples presented in Figure 2 reveal that some CC participants' letter forms were not fully closed and anti-clockwise movements did not always align neatly with letters, affecting legibility.

Figure 2. Examples of CC pupils' joining (*quick* and *brown*)

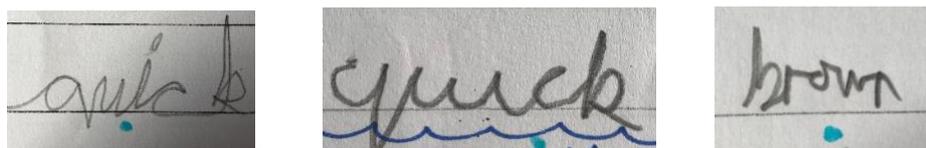
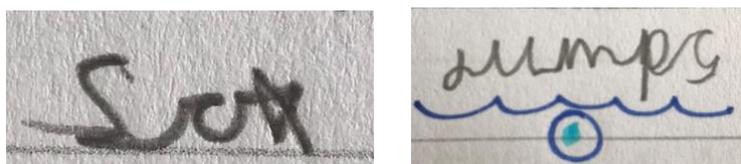


Figure 3 shows that, in several cases, individual letters were not well specified or completed correctly by M participants (dots and cross-strokes).

Figure 3. Examples of M pupils' joining (*fox* and *jumps*)



RQ3: Are spelling and handwriting efficiency (i.e., speed and legibility) related? Does this differ across the two groups?

Significant correlations ($p < .001$) were found between spelling ability (HAST-2) and every measure of handwriting (speed and legibility) for the M group. Here positive correlations were largely noted, indicating better spellers wrote more ($r = .38$ to $.50$); while the significant negative correlations between spelling and HLS measures in fact confirm that spelling was correlated with legibility ($r = -.32$ to $-.46$). In contrast, although there was a significant positive correlation between spelling ability (HAST-2) and speed of production in the alphabet task ($r = .34$, $p < .05$) for the CC group, this was not

the case for the other measures of writing speed (CBM-W and copy fast; $p > .05$). For this group, legibility was related to spelling accuracy in the same task (i.e., copying, $r = -.60$, and writing, $r = -.43$; both $p < .001$). These negative correlations reveal that better spellers also had more legible handwriting.

4. Discussion

This study set out to explore the relationship between the handwriting style taught on school-entry and speed and legibility of handwriting in Year 2. The handwriting of participants, who had first been taught individual letters and introduced to joining later, was compared to those who had been explicitly taught continuous cursive handwriting from school-entry. Of note here, contrary to Bara and Morin's (2013) finding that pupils tend to revert to the first handwriting style taught, the majority of participants in both groups were using a continuous cursive style at the time of data collection; even M pupils, who had first mastered individual letters.

Instructional method and speed

Although both groups were comparable in terms of their performance on quickly writing out the letters of the alphabet, the CC participants were found to write significantly more than the M group in both the copying and free-writing task. The early years of instruction are key (Bara & Morin, 2013; Sassoon, 2003) and, in spite of the challenges of learning cursive letter forms (Meulenbroek & Van Galen, 1990; Hulme, 2015), CC participants appeared to have achieved automaticity of production early on. Having to learn two handwriting styles (manuscript and then continuous cursive), may have impacted on productivity for the M group. They effectively had a range of allographs from different repertoires (manuscript and cursive) from which they could select (Meulenbroek & Van Galen, 1990). It is also possible that these pupils had not had enough time to fully automatise the extended range of joins taught in quick succession.

Instructional method and legibility

Significant group differences in legibility were noted for both copying and free-writing tasks. In both cases, group M produced a greater proportion of legible words than group CC. This result was further corroborated by the HLS scores for overall legibility in both tasks, and analysis of the individual HLS components revealed significant group differences for *legibility*, *effort*, *letter formation* and *alterations*. Group M participants' superior legibility in both writing tasks was seemingly at the expense of speed (results discussed above) and it is important to remember that efficient handwriting requires both speed and legibility (Feder & Majnemer, 2007). This finding is contrary to that of Bara and Morin (2013), who noted cursive writing as the most legible style. However, it is worth noting that participants in their study were older (8-10 years) and potentially at a more advanced stage of writing development, having had the benefit of more time to automatise transcription skills.

Several issues appeared to impact on the legibility of individual words for some participants from the CC group. CC pupils had been consistently taught to use entry strokes from the baseline. Evidence of this was clear in the alphabet task, where most participants formed individual letters in this way. In both writing tasks, a few CC pupils returned to the line in order to join when a horizontal join would have been appropriate. Ironically, the much-valued automaticity of letter production may have impacted on legibility for these pupils. For many others, letters were not fully closed and anti-clockwise movements did not always align with letters, again affecting legibility.

Another possible explanation for the difference in legibility between groups could be the frequency of instruction, with group M benefitting from four sessions weekly, but group CC, only one.

Interestingly though, this difference in instructional frequency did not appear to have impacted on speed for group M, but with their recent introduction to all joins and an emphasis on style and legibility, this is not surprising.

The relationship between the transcription skills (spelling and handwriting)

Mean spelling test scores were above-average for both groups and no group differences were observed for spelling accuracy in the writing tasks; therefore, contrary to the work of Cripps and Cox (1989), no link was established between instructional method and spelling accuracy. However, different profiles were observed for this relationship. For group M better spellers were also better handwriters. This supports existing research that has also linked spelling ability and handwriting speed (Berninger, 2009; Sumner et al., 2013; 2014) but also extends this research to handwriting legibility. For the CC group, results revealed a link between spelling and handwriting legibility but not speed; better spellers produced more legible text but were not more productive. It is not clear why the transcription skills were more closely related for group M than for group CC, and this could be of interest to future researchers.

Implications for practice

Although the two samples differed in size, groups were comparable in both age and geographical area. A number of implications can be considered from the findings. Learning all individual letters with entry-strokes from the baseline (CC group) has appeared to impact on later legibility for some. Contrary to the rationale of Cripps and Cox (1989), no evidence was found to validate the supposition that continuous cursive handwriting supports better spelling. Furthermore, the curriculum does not demand a particular style; even for *greater depth* standard at Key Stage 1 a pupil need only demonstrate, after discussion with a teacher, that they are able to use some joins (STA, 2018). The critical priority should not be a particular style or “penmanship”, but the development of automaticity in letter production, speed and legibility (Feder & Majnemer, 2007). Although writing speed is clearly advantageous in some situations, without legibility the writer risks the negative impact of the

presentation effect whereby raters have been shown to down-grade work which is illegible (Graham et al., 2011). Pupils from both settings would benefit from carefully structured, systematic and explicit teaching of different joins in order to secure both legibility and speed (Hoy et al., 2011; Santangelo & Graham, 2015) and awareness of when not to join. Efficient and legible writing may look quite different for each writer and a mixed-style may offer the advantages of both speed and legibility, with some letters joined and some left un-joined (Graham et al., 1998). Further, the clear link between spelling ability and handwriting speed and legibility, suggests that both transcription skills should be prioritised in the early years of school.

In sum, early instructional approaches appeared to have a significant impact on both legibility and speed of handwriting by Year 2. The writing speed of those who had only been exposed to a single style (CC) was significantly faster than that of those who had essentially learned two styles (M), yet legibility was lower for children from the CC group. Literacy leaders should seek opportunities to further develop practitioners' understanding of pedagogy and research in order to develop evidence-based practice.

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