An Investigation into the Degree of Similarity in the Handwriting of Identical and Fraternal Twins in New Zealand

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A document examination case involving the handwriting of identical twins showed a striking degree of similarity in their handwriting. Following this observation research was undertaken to gauge the degree of handwriting similarity in a larger sample of identical and fraternal twins' handwriting. Handwriting samples and questionnaires allowed the investigation of factors such as genetically linked similarity, schooling, and handedness. The results showed that none of the twins wrote exactly alike, however in some cases there was a marked degree of similarity. No evidence was found to suggest that identical twins write with more similarity than fraternal twins. While the effect of genetic factors on handwriting could not be truly judged, the study did highlight the need for care and thoroughness in any examination of handwriting.

Introduction

A New Zealand court case involved fraud offences where the defendant was one of a set of identical twins. The evidence against the defendant relied, for the most part, on an eye witness identification of the twin passing the fraudulent documents, and on evidence from the document examiner identifying her handwriting on the same documents.

Some doubt was cast over the eye witness identification when it was found that the witness knew the defendant and her twin. While certain one of the twins was responsible, the witness was not quite sure which one.

The defendant pleaded not guilty and the positive handwriting evidence from the document examiner became vital to the prosecution case. Early in the hearing it became clear that the defense would pursue the line that his client was a twin and argue that since they were identical, it was possible that their handwriting was also very similar.

In this case the examiner had good handwriting specimens from both twins and he was able to positively identify the defendant, obviously excluding her twin. He was, however, surprised at the amount of similarity found in the two writings.

It was decided that research should be conducted on the handwriting of twins to gauge the extent of any similarities. The research was also anticipated to yield results relevant to testing the claimed basic axiom of handwriting examination; that is, given a sufficient quantity of writing that no two people write exactly the same (Hilton, 1963).

An initial literature search revealed only one article which briefly touched on the subject of twins' handwriting (Duke, 1958).

A more thorough investigation into texts on the subject revealed an American (Beacom, 1960) and Canadian (Gamble, 1980) article dealing specifically with the handwriting of twins.

Each of these papers dealt with the handwriting of twins in different ways and concluded that there were certainly similarities found in their handwriting. However these were not present to the extent where, in the opinion of the authors, the handwriting of two writers could be mistaken for that of one writer by a competent document examiner.

The purpose of this research was to test the findings of previous papers on the subject, dealing specfically with the handwriting of twins in New Zealand. Further aims were to find any evidence of genetically linked similarity in twins' handwriting and to investigate the degree of similarity of twins' handwriting compared to that of ordinary siblings.

In 1989, twin births made up 643 from a total of 57,427 live births in New Zealand (N.Z. Statistics, 1990). This translates into 1.1 percent or approximately 1 in every 89 births. Obviously the number

of twins born is double the figure mentioned as the figure relates to births and not the number of babies. These figures are comparable with world trends, where twin births vary from 1 in 70 to 1 in 145 births. (New Encyclopedia Brittanica, 1987).

There are two main types of twins, identical (monozygotic) and fraternal (dizygotic). Identical twins are conceived from a single egg and sperm. These twins are not only the same sex but made up of the same genetic material.

Fraternal twins develop from two separate eggs developed from two separate sperm. Fraternal twins may be of the same or different sex and are, in effect, no different to ordinary siblings other than that they are born at the same time (Gamble, 1980).

Because fraternal twins can be compared to ordinary siblings, no attempt was made to obtain handwriting samples from ordinary siblings. A direct comparison was made between identical and fraternal twins.

The research concentrates on identical and fraternal twins and does not consider less common cases such as Siamese or mirror twins.

In handwriting examinations, it is the comparison of all of the features or characteristics of a handwriting which leads to an opinion regarding authorship. Accordingly, the definition of similarity for the purpose of this study, and as used in this paper is that of "having characteristics in common, very much alike, comparable" (Websters Dictionary 1961). In the comparison of handwriting from many sets of twins, the characteristics of those handwritings were compared to see if they were common to both twins or if the twins differed.

Methods and Materials

In order to obtain sufficient samples of twins' handwriting an approach was made to the organizers of a "Twins and Multiple Births" convention held in Wellington, New Zealand.

For privacy reasons initial contact could not be made directly with the twins, but was channelled through the organisers of the convention. This meant there would be no control over the make-up of the sample in terms of factors such as sex, age distribution, and ethnic origin. However, the offer from the organizers of the convention was considered the best option as their database regarding twins was fairly recent and easily accessible. Convention attendees, along with family and personal contacts, formed the base for the research.

Each twin was sent a letter of introduction and given a brief outline of the research. They were requested to complete a short questionnaire and provide a handwriting sample. The 'London Business Letter' (Osborn 1929) was chosen as the handwriting sample for a number of reasons. These included the assurance of uniformity, the amount of writing it provided for examination, and the range of letter forms included.

Each twin was asked to complete their sample twice, once in printing and once in cursive writing. This was done to overcome the possibility that each twin would choose to complete it in a different style of handwriting, making a comparison impossible.

The participants were requested, if possible, to use ballpoint pens when completing the samples. It was hoped that there would be striation patterns present in most samples to allow for the checking of handedness factors such as direction of stroke in 't' crossings and zeros (Franks 1985).

Two lined sheets of A4 paper were included with the questionnaires for the participants to use when completing their samples. This was done to further assure uniformity and to allow consideration of formatting and placement habits.

No research was undertaken to identify the ideal sample size for twins' handwriting. Papers mentioned previously (Beacom, 1960; Gamble, 1980) had used sample sizes of around 50 sets of twins, although one of those papers was limited to identical twins only.

A total of 252 letters of introduction and questionnaires were sent, mostly to twins who attended the "twin and multiple births" convention. While there was no way of predicting the return rate, it was hoped that around 100 sets of twins would reply.

Before the cut off date, a total of 95 sets of twins replied, giving a return rate of 75% (95/126). This figure does not include 15 questionnaires and samples where only one twin replied.

The twins ranged in age from 11 to 82 years with a mean age of 39. The largest percentage (25 sets) were in the 21–30 age group. (See Figure 1).

Samples were received from 28 sets of fraternal twins and 58 sets of identical twins. A further nine sets of twins stated they were unsure whether they were fraternal or identical.

A number of these 'unsure' twins made mention of awaiting the results from DNA tests undertaken to positively determine whether or not they were identical. They considered they were probably identical.

No New Zealand figures were available regarding the proportion of fraternal to identical twins. However, overseas figures indicate that fraternal twins are more common (N.Z. Statistics, 1990). One explanation for the high percentage of identical twins participating in this research is that identical twins are more easily recognised, contacted more easily, and possibly more interested in twin events such as the convention where the participants in this study were found.

Seventy-three sets of twins were both female. This could not be considered a random sample and probably points more to the fact that the twin convention was dominated by female attendees. Of the remainder, 16

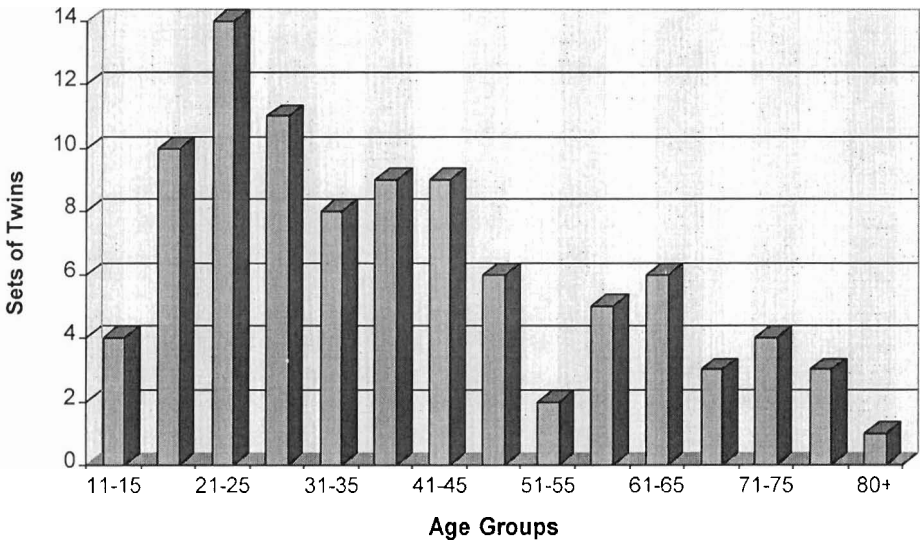

Figure 1. Age distribution of twins.

sets of twins were both male and a further six sets one male and one female. (Of course, the six mixed sex sets of twins were fraternal).

Some interesting statistics arose in the handedness figures specifically relating to left handed twins. While only 3 sets of twins both chose the left as their preferred hand, another 25 sets showed one left and one right handed. The remaining 67 sets were both right handed (See Figure 2).

Therefore, out of 190 twins, 31 were left handed or 16.3%. This figure is higher than was found in previous studies of New Zealand school children of 11.6% using the left as their preferred hand (Walker, 1988). Of the twins where handedness differed, 11 were fraternal while 12 were identical. While this obviously makes the percentage of fraternal twins preferring different hands higher, this is contrary to a previous study in which the results were opposite and idential twins showed a higher percentage of left/right handed pairs (Beacom, 1960).

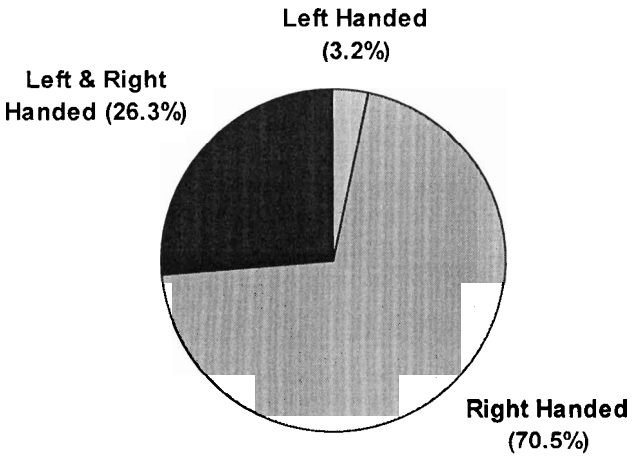

Figure 2. Handedness of sets of twins.

Almost without exception the twins both attended the same primary school and in by far the majority of the cases they were both placed in the same class for most of their primary education. This is the period of their lives aged 5–12 years when handwriting is actively taught and learned (Figure 3).

In only one case did the twins attend different schools. This case related to a set of fraternal twins, one male and one female, who were separated at six weeks of age and reared separately in geographically different locations. They had only met each other again at age 75 years. (A more detailed examination of their handwriting will follow later in the paper).

The twins were requested to state their ethnic origin purely for statistical purposes. An extremely high percentage of participants were New Zealand Caucasians with a few English twins. There were one set each of Chinese, Canadian and Maori (indigenous people of New Zealand) twins. No explanation can be given for the low incidence of Maori twins. I could find no statistical information which stated the incidence of twin births among Maori people.

The handwriting samples were examined using six different categories:

1. General pictorial similarity
2. Writing slope
3. Overall writing size
4. Baseline characteristics
5. Formatting and placement habits
6. Individual letter forms

The examination of pictorial similarity was not intended to be a detailed examination. On the contrary it was intended as an initial impression to assess whether the twins' handwriting looked alike. Obviously features which would be examined later such as the slope and size of the writing would have a significant influence on the pictorial effect.

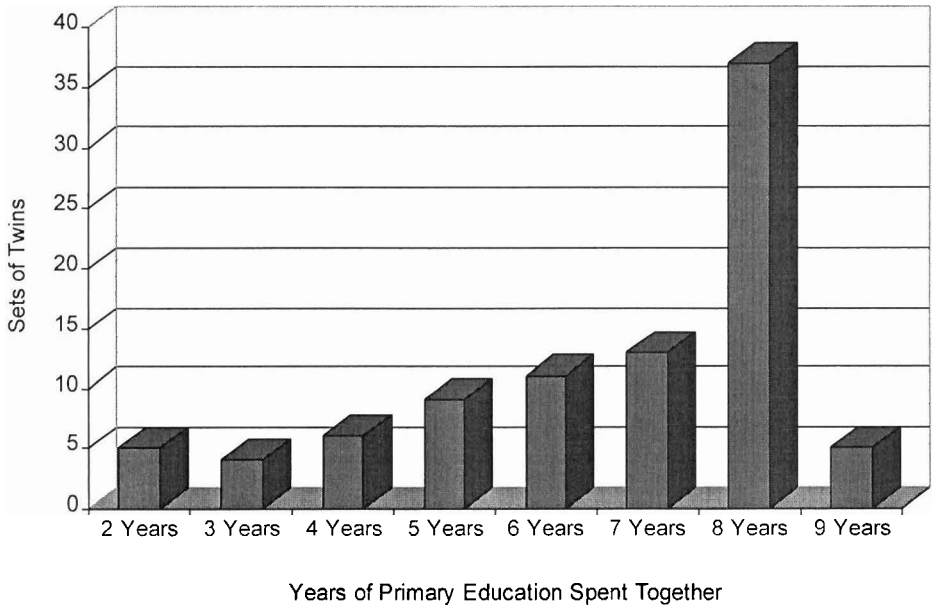

Figure 3. Number of years of primary education spent together by sets of twins.

Each set of twins' samples were examined and placed into one of three groups:

1. Little or no pictorial similarity
2. Some pictorial similarity
3. Noticeable pictorial similarity

Very early on in the examination, it became appa rent that in many cases the twins favoured either printed or cursive styles of handwriting, largely ignoring the other style. In these cases there was often a big difference in the level of skill shown between their printed and cursive samples.

Because of this, wherever possible the comparison was made using the preferred style of handwriting. In most cases this was chosen on the basis of the style used to complete the questionnaire.

The writing slope examination grouped the samples according to the following factors:

1. Similar
2. Difference of less than 15°
3. More than 15° difference

The next three examinations undertaken were of size, baseline, and placement and formatting habits.

All these factors were assessed by a judgement as to whether they were similar or dissimilar. By limiting the number of choices to two, the examination time was minimized while still obtaining clear results from the samples. This also meant there were fewer samples which could fall into more than one group, giving the results greater clarity.

The final category of examination undertaken was that of individual letter forms. The samples for which this category was used were limited to those which had at least some pictorial similarity. There seemed little point with obviously pictorially different handwriting in further differentiation. The specimens were each examined to locate, if possible, five individual letter forms which differed from those used by their twin. Those letter forms which occurred in the specimens on a number of occasions were used first to counter the possibility of including 'accidental' constructions in the handwriting (that is, corrections, retouching, speed errors, etc).

At the conclusion of the examinations, the results were compared with characteristics from the sample population to check if any significant relationships emerged.

Results and Conclusions

The results from the pictorial similarity examinations showed that 17 of the 95 sets of twins had what was deemed to be a noticeable degree of pictorial similarity in their handwriting. While obviously some were more similar than others the degree of similarity was surprising and greater than had been expected. Of the 17 sets of twins 11 (19% of the total) were identical and four (14.3% of the total) were fraternal. It was interesting to note that all but two of these sets of twins had spent five or more years in the same primary school class. The two sets who had not were aged 13 and 11 years respectively, and more development in their handwriting seems likely. Their writing at the time of this study was very basic and lacked individual character.

An example of a set of twins whose handwriting was placed into the 'noticeable pictorial similarity' category is shown in Plates 1 and 2.

In this example both the cursive and printed styles were very similar. In all other cases where pictorial similarity was found it was restricted to

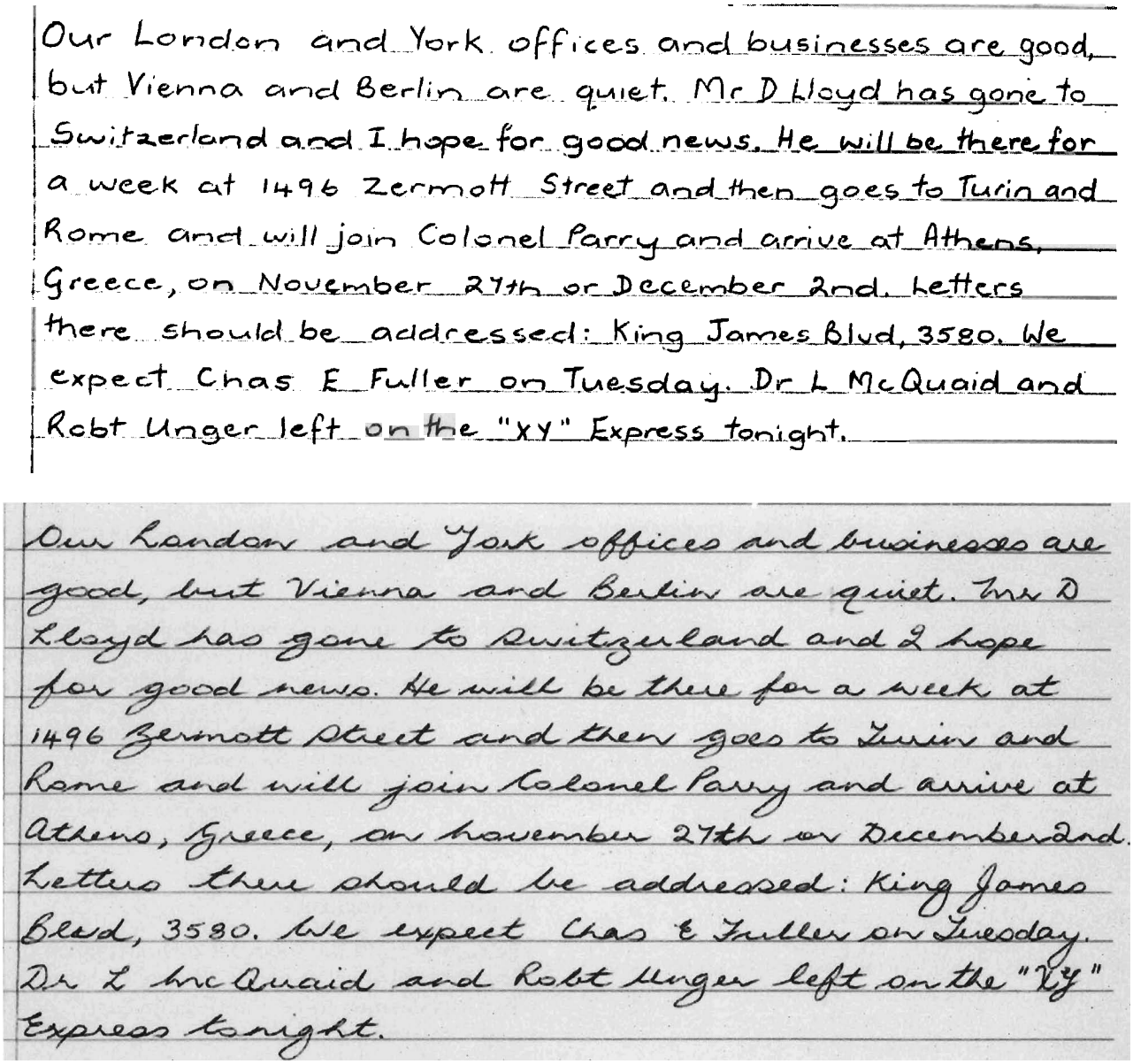

Plate 1. Shows the handwriting from one twin which shared striking pictorial similarities in both printed and cursive styles compared with plate 2. The twins were both female, fraternal, and in the 46–50 years age group. They attended the same school and were in the same class for more than seven years.

one style or the other. Some interesting points about this example were that not only were the twins fraternal, but one was left handed and the other right handed. The simplest method of differentiating between the two was that the left handed twin used right to left "t" crossings (a left handed trait) while the right handed twin did not.

In the final analysis the majority of all the twins samples showed little or no pictorial similarity (more than 50% in the case of both identical and fraternal twins). A good example of a sample falling into this group is shown in Plate 3.

The remaining samples showed some pictorial similarity. While not being strikingly similar, in these cases there was some feature or features in the handwriting which warranted a second look. Examples of such features were an extreme writing slope or unusual formatting habit, such as paragraphs, line and word spacing, or indenting. On further examination however, the writing really had very little else in common.

It was found on completion of the examinations for writing slope, size, baseline, and formatting and placement habits that these examinations, as ex-

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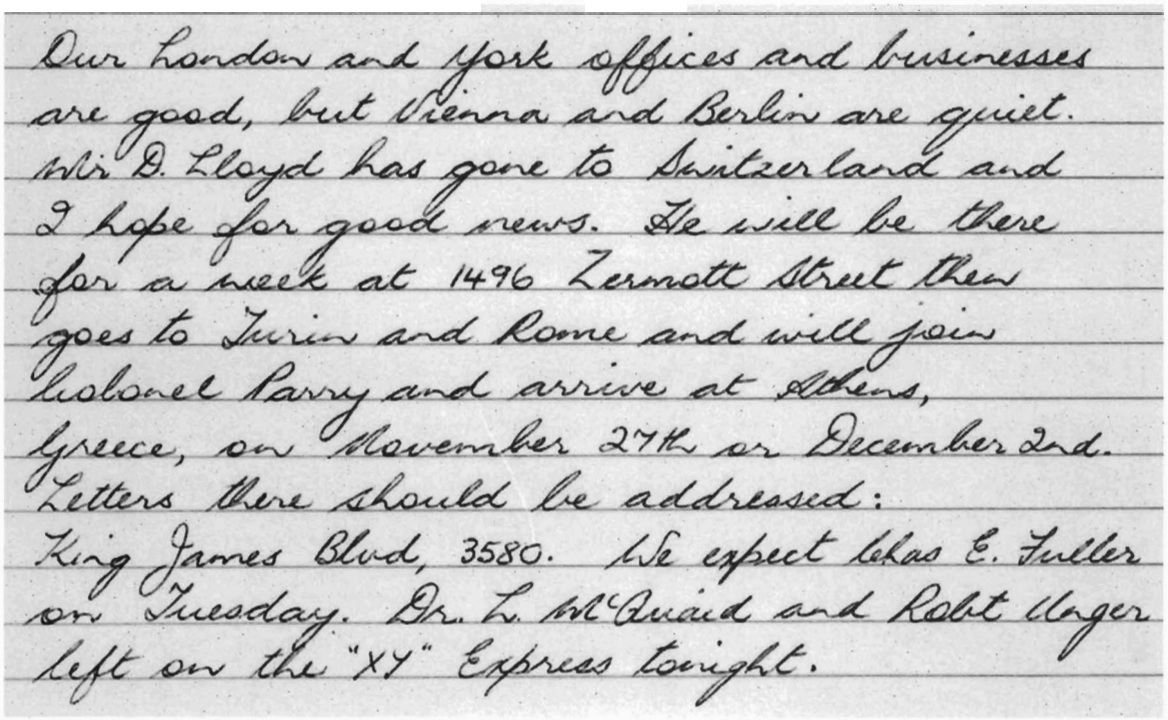
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Plate 2. Plate 2 shows the handwriting from the other twin (See Plate 1) which shared striking pictorial similarities in both printed and cursive styles. The twins were both female, fraternal, and in the 46–50 years age group. They attended the same school and were in the same class for more than seven years.

pected, greatly affected the level of pictorial similarity. In general, where a set of twins' handwriting differed to any great degree in one or more of these categories, the pictorial similarity was low.

So, although the pictorial similarity was the first examination and only meant as an initial impression, those examinations following it verified that initial look and showed those impressions to be a good pointer to the true level of similarity in the handwriting.

Plate 3 shows the handwriting of twins which had little or no pictorial similarity and it can be

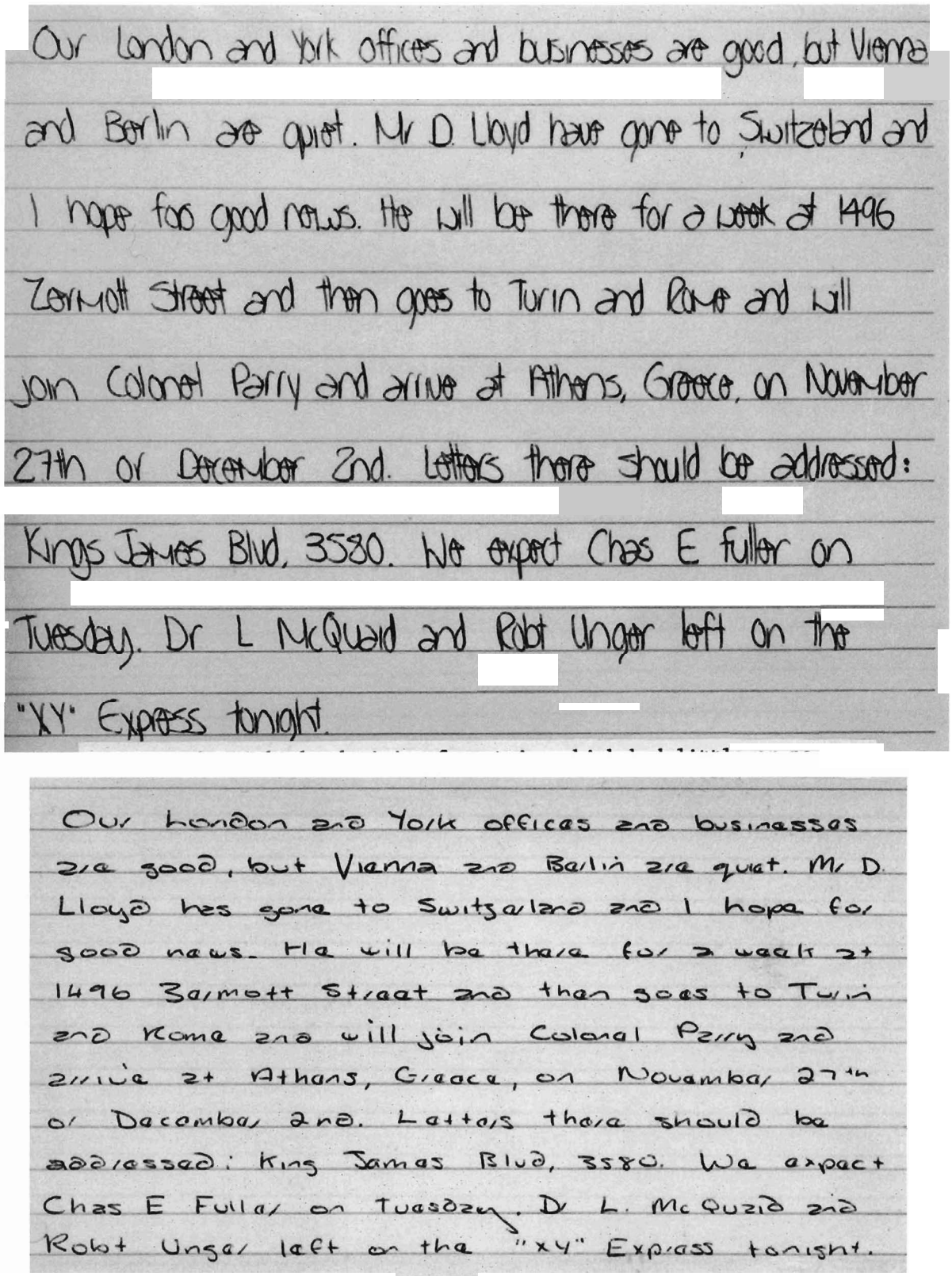
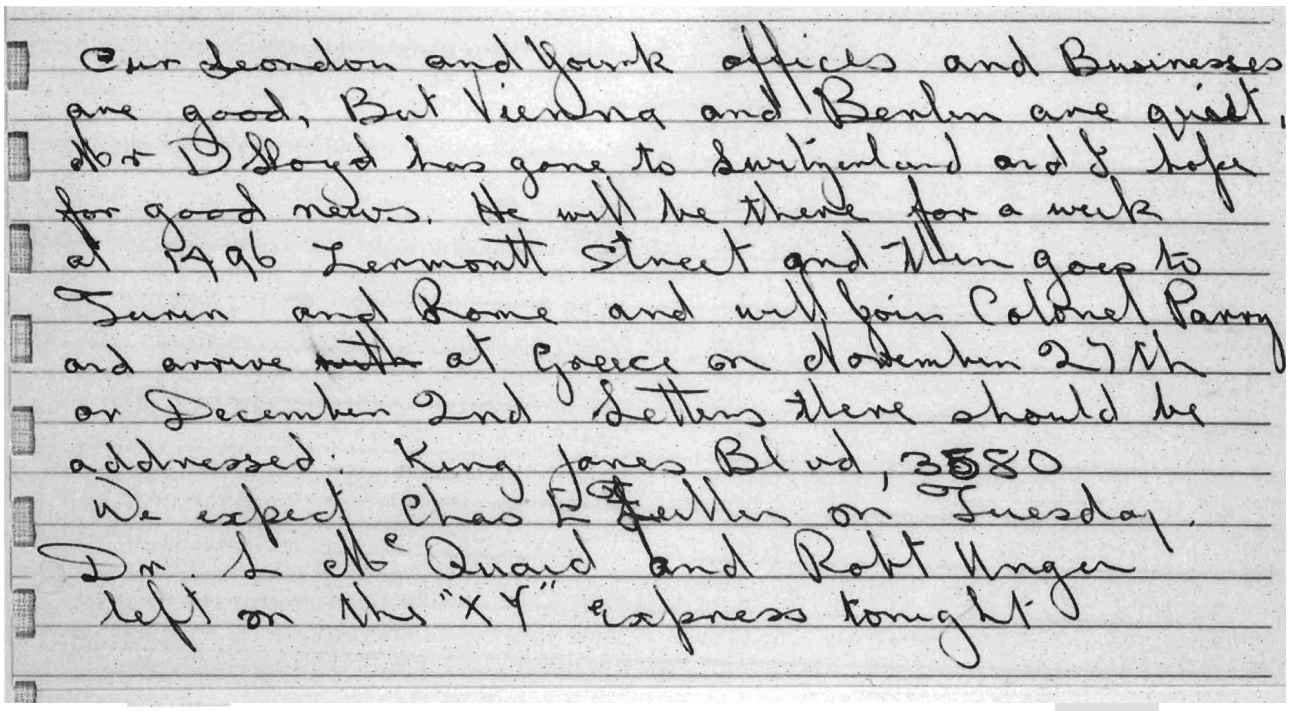


Plate 3. Shows handwriting from twins which had little or no pictorial similarity. Different size and formatting habits are also features of these samples. The twins were identical females in the 21–25 years age group. They attended the same school and spent the first four years in the same class.



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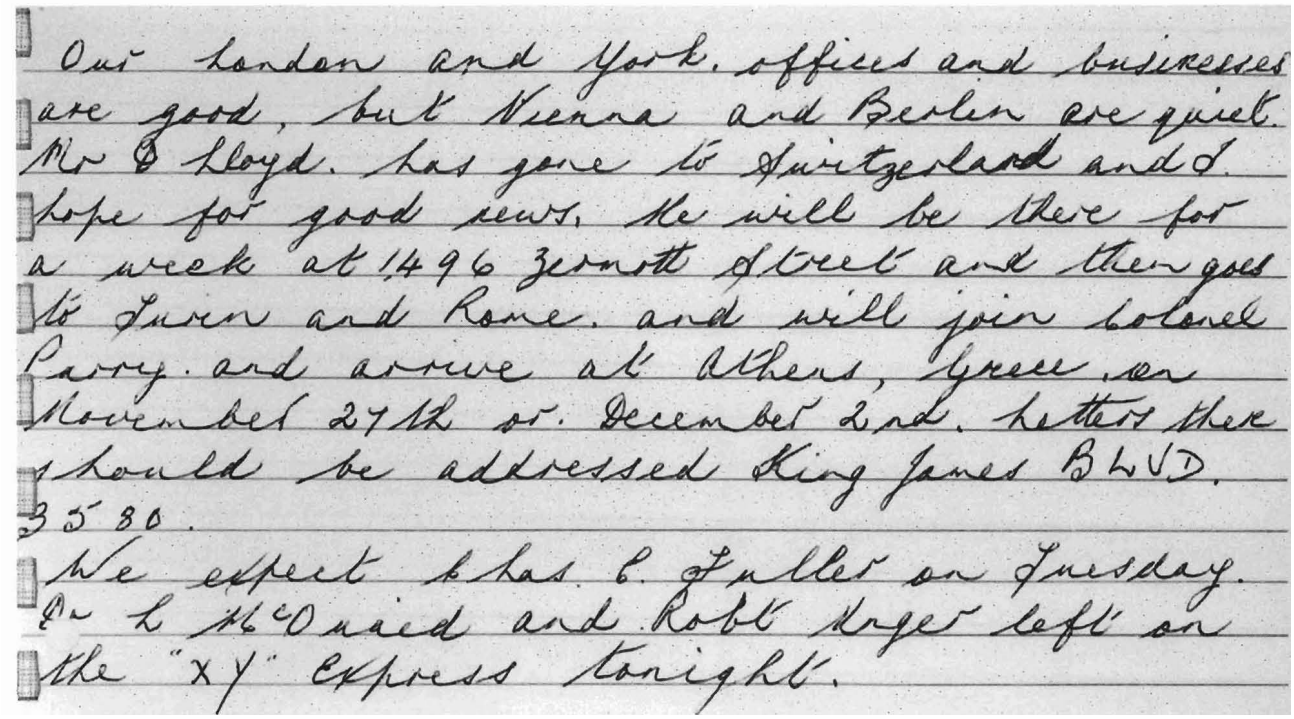

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Plate 4. Shows handwriting from twins with vastly differing slope habits. The twins were a male and female pair and fell into the 66–70 years age group. They had attended the same school and were in the same class for six years.

clearly seen that two of the factors causing this are the differences in writing size and setting out habits.

Handwriting from twins with very different writing slopes is shown in Plate 4 and this was the major factor for those handwritings scoring in Group 1 in the pictorial similarity examination (see Table 1). The results from the writing slope, size, baseline, and placement and formatting habits are detailed in Tables 2, 3, 4, and 5.

Table 1. *Pictorial similarity*

	Identical	Fraternal	Unsure
Little or No Pictorial Similarity - (1)	33 (57%)	17 (61%)	3 (33%)
Some Pictorial Similarity - (2)	14 (24%)	7 (25%)	4 (44%)
Striking Pictorial Similarity - (3)	11 (19%)	4 (14%)	2 (22%)
Totals	58	28	9

Table 2. *Slope*

	Identical	Fraternal	Unsure
Same	13 (22%)	9 (32%)	2* (22%)
Less Than 15° Difference	27 (47%)	10 (36%)	5 (56%)
More than 15° Difference	18 (31%)	9 (32%)	2 (22%)
Totals	58	28	9

*Inconsistent but similar.

Table 3. *Size*

	Identical	Fraternal	Unsure
Similar	26 (45%)	15 (54%)	4 (44%)
Different	32 (55%)	13 (46%)	5 (56%)
Totals	58	28	9

Table 4. *Baseline*

	Identical	Fraternal	Unsure
Similar	42 (72%)	17 (65%)	6 (67%)
Different	16 (28%)	11 (39%)	3 (33%)
Totals	58	28	9

Table 5. *Placement and formatting*

	Identical	Fraternal	Unsure
Similar	39 (70%)	17 (65%)	6 (67%)
Different	17 (30%)	9 (35%)	3 (33%)
totals*	58	26	9

*Two samples each from individual and fraternal twins could not be examined for formatting habits because their samples had not been completed fully enough to allow for any conclusions.

In every case where similarity was found in the handwriting of a set of twins it was possible to find at least five different letter forms; that is, different construction habits and other aspects which stood them apart. Even in the most similar handwritings this was a simple task.

It is interesting that there were no significant differences found in the results for the different types of twins (fraternal and identical). This result concurs with those found in the pictorial similarity examination, and the only conclusion that can be reached is that there is no evidence to suggest the identical twins write more similarly than fraternal twins.

Fraternal twins are genetically different in the same way as ordinary siblings except that they were born at the same time. Fraternal twins in this study all attended the same school and were in the same class for most of their primary education.

A number of the samples from fraternal twins found to have similarities were also found to contain a number of characteristics possibly derived from the handwriting system they had been taught. It seems unlikely that siblings who attended different schools or were taught different writing systems (as may happen with brothers and sisters or where there is a large age gap) would exhibit the same levels of similarity as fraternal twins. However, this observation is fragile and additional research would be needed to determine if it had any substance.

So while for the purposes of this study fraternal twins were treated as ordinary siblings, it is acknowledged that environmental factors such as their similar upbringing and schooling may have had some added effect not generally present among ordinary siblings.

There were 25 examples in the study of sets of twins where one was left and one right handed. The handwriting of each of these twins was examined in more detail with particular regard to direction of stroke.

From the 25 left handed writers, 5 stated that although they were born left handed and used their left hand for most activities, they had been made to write with their right hand at school and this had continued in later life. Forced right hand writing was formerly common practice in schools, but has now been superseded by allowing children to write with whichever hand they choose.

Each of the writers forced to use their right hand were in the 50+ age group. None of these writers showed any characteristics in their handwriting associated with left handedness.

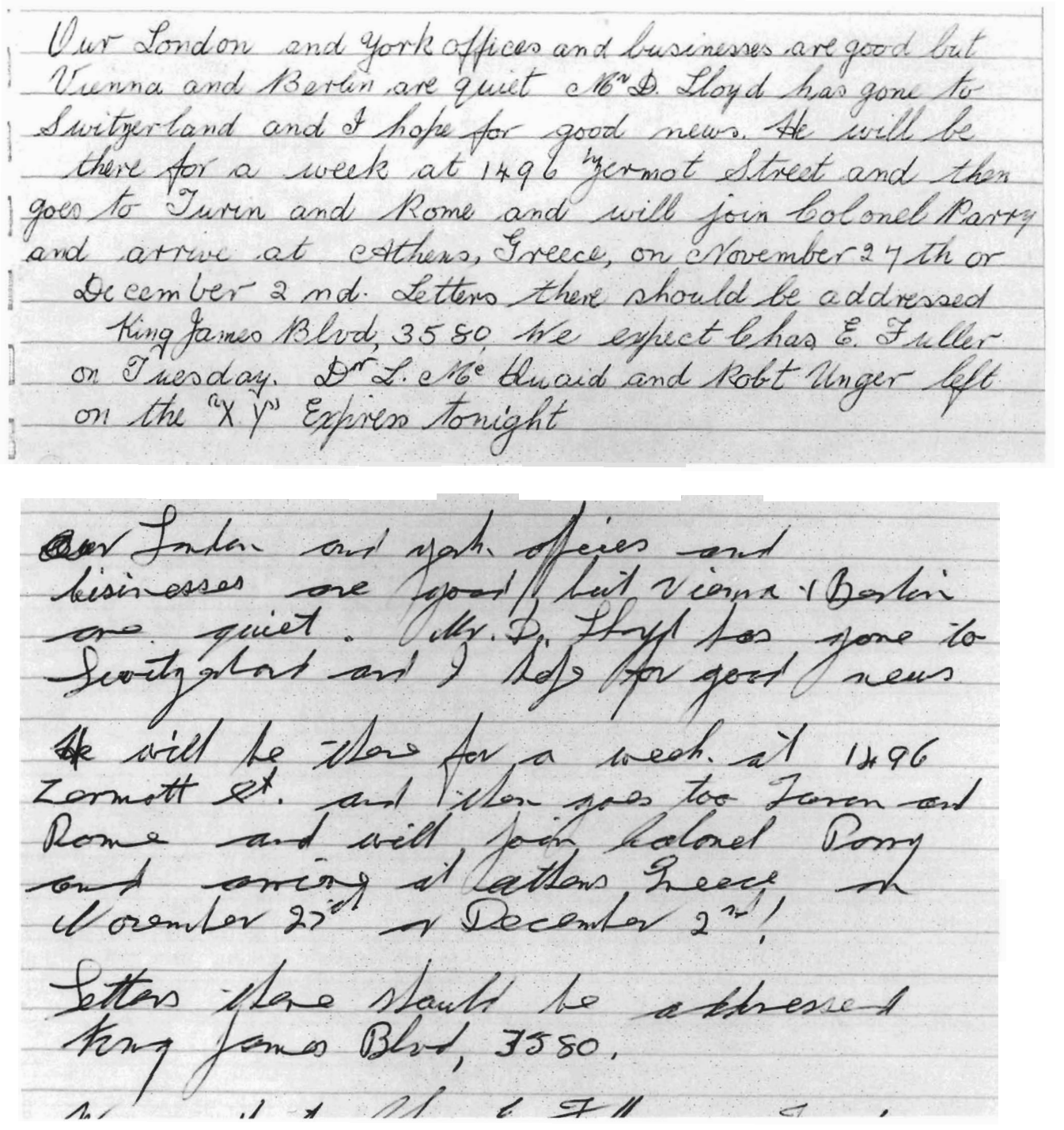

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Plate 5. Shows the handwriting of twins who were brought up separately and attended schools in different geographical locations. The twins were a male and female pair and fell into the 76–80 years age group. Their handwriting showed little or no pictorial similarity, and also differed in writing size and formatting habits.

Of the remaining 20 left handed writers, 16 had left handed characteristics in their handwriting; for example right to left 't' crossings and/or clockwise zeros.

None of the right handed twins showed any of these characteristics. Out of 20 preferred left hand writers, 16 (80%) could be differentiated from their twin on handedness features alone. This figure translates to 17% of the total sample; and while this figure is not exceptionally high, it is certainly useful. This is especially so when it is considered that in this research the handwriting samples

found most pictorially similar belonged to twins preferring different hands (Plates 1 and 2). In that case, the left handed twin crossed her 't's in a right to left direction.

Genetic or hereditary factors in handwriting could be features passed on from previous generations, as opposed to taught or learnt features.

To assess any similarities due to genetic factors in the handwriting of twins, it would be necessary to find personal characteristics which can be proved not to have been learnt or taught.

As previously mentioned in this study, only one set of twins were brought up separately and may have learned different handwriting systems. Therefore, any similarity in their handwriting could be due to genetic factors or chance. Samples of their handwriting are shown as Plate 5 and as can be seen there was no similarity at all in the samples.

It would be foolish to make any conclusions on the basis of this one case. However, in all of the specimens examined, it is hard to find any similarities which could be attributed to genetic factors and not the system of writing taught or learnt. One point already noted in many of the similar handwritings was the large number of shared characteristics possibly derived from the system taught. No conclusions could be reached on the possibility of genetic factors being present in the handwriting of twins.

Summary

This research was undertaken as a result of a case where the handwriting of identical twins was examined and found to contain an unusual number of similarities. The handwriting from 95 sets of twins was obtained and examined to gauge the degree of similarity found, and to test the handwriting maxim that no two people write exactly alike. This study dealt solely with New Zealand twins and complements prior work in other countries.

Handwriting samples were obtained from both fraternal and identical twins, and the results showed that there was no evidence to indicate that identical twins wrote more similarly than fraternal twins or vice versa. (Fraternal twins were to be found to be genetically different in the same way as ordinary siblings).

It was interesting to note that in a number of examples, there was a noticeable level of similarity in the handwriting of a set of twins, although there was no special formula found for predicting what set of circumstances led to this similarity. The only common feature twins with similar handwriting had was that the great majority of them spent all of their primary schooling together. While in some areas the similarity was very noticeable, there were no cases of two twins writing so similarly that their writing could be mistaken as belonging to each other.

This study has supported the contention that no two people write exactly alike. However, it has also emphasized the need for care in any handwriting examination. The pictorial similarity was such in some cases that without the ample samples available and the background information provided, it is suggested mistakes could be made.

While no combination of factors was found to explain why some twins wrote very similarly and others quite the opposite, it is obvious that each examination must be undertaken on its own merits and the same care and thoroughness shown on every occasion. The question of genetic factors in handwriting could not be answered in this study.

Note

It is acknowledged the opinions expressed by the author regarding the similarity or dissimilarity of the handwritings of twins examined in this research are subjectively based and of course, in this case, the author knew the handwriting samples were all by different people. As such, this is not representative of the situations encountered in case work.

The handwriting samples gathered in this research will be used, along with other handwriting samples, in the compilation of blind proficiency tests. It is hoped the results of these tests will more accurately reflect examiners abilities to distinguish the writings of different authors.

However, the fact remains that in this research two of the 'most similar' appearing handwritings had consistent differences in such compelling features as direction of stroke.

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