A Study on the Age Related Retention of Individual Characteristics in Hand Writings and Signatures for Application during Forensic Investigation

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ABSTRACT: Handwriting is the means of communication and recording information in day-to-day life even with the introduction of new technologies. Languages are systems of symbols; writing is a system for symbolizing these symbols. Handwriting is quite distinctive [1]. Each individual's writing style is personal and unique which is the result of unconscious, automatic actions and interaction between a person's brain, eye and hand. Writing is also influenced by the person's physical state [2], influence by drugs or alcohol [3], age [4], the force on the writing tool [5] and other environmental factors [6]. An individual's writing styles change throughout the lifespan of a person and the degree of change may vary greatly. No two individuals, including twins can write alike [7-8]. Investigators and forensic document examiners have long been tasked to use inscriptions and markings as clues to identify their writers. This research aims to study the age related retention of individual characteristics in handwritings and signatures over a period of time ranging from two to ten years. Samples of seventy past handwritings and signatures were collected from individuals and compared with the present handwritings and signatures of those individuals. Individual characteristics that were found to be retained as well as those that were modified were identified and compared. The subjects were healthy and sound. In the first step magnifiers were used to examine the writings and signatures and then comparison microscope was used for detailed document examination. The analysis of writing style and signature characteristics indicated changes attributable to deviation. In spite of these changes occurring due to age, the characteristics that were retained are found to be useful in attributing authorship while examining documents.

Keywords: Forensic science, handwritings, signatures, individual characteristics, retention

Introduction

A document can be defined as an item that contain writings, symbols, marks whether visible or invisible and conveys a meaning for someone. Document examination is defined as a discipline in which a document is examined and analyzed in order to obtain information that can be used to serve the justice system based on the scientific explanations [9]. Handwriting identification is a process in which handwriting is used as a mean of comparison and discrimination. In a more specific manner, handwriting identification can be based on evaluation of the significance of their similarities and dissimilarities. The amount of significant similarities and dissimilarities will be the cue in concluding whether the handwriting belonged to a particular person or not in cases like forgery and fraud. Population studies have been conducted to identify the class characteristics among the races [10-12]. Signatures and handwriting have long played a role in day-to-day activities like business transactions, casual writing of letters, and listing of required article in paper before going for shopping. In forensic science they are used to authenticate documents, as evidence to establish crime or innocence, etc. This research aims to study the age related retention of individual characteristics in handwritings and signatures over a period of time ranging from 2 to 10 years.

Materials and methods

(a) Sample collection

Samples of seventy past handwritings and signatures from seventy volunteers were collected and these samples were written or signed 2 to 10 years prior to collection. Sample handwritings and signatures were correspondingly obtained from the same volunteers. The age of the subjects ranged from 20 to 35 years and they did not exhibit any health problem that would affect handwritings. The past samples designated as Q were serially numbered as Q1 to Q70 while the present samples designated as S were serially numbered as S1 to S70. Regarding past samples, whenever more than one signature or handwritings was collected from the same individual, such writings were designated

with roman alphabet following the sample number as chronological basis such as Q1a for the past sample in an earlier year and Q1b for the past sample in a later year both from the same individuals.

The details of sample collections are as shown in **Table 1**. The handwritings and signatures included Bahasa Malaysia and English for both of which the script is same.

Table 1: Details of sample collection

Sample No	Type of sample	Year of past sample & designated as Q (presumed Questioned)	Year of recent sample & designated as S (presumed Specimen)
1	Handwriting	2000 (Q1a) , 2003 (Q1b)	2009 (S1)
2	Handwriting	2002 (Q2)	2008 (S2)
3	Signature	2002	2008
4	Handwriting	2003 (Q4a) ,2005 (Q4b)	2008 (S4)
5	Handwriting	2003	2009
6	Handwriting	2004	2008
7	Handwriting	2004	2008
8	Handwriting	2005	2009
9	Handwriting	2005	2008
10	Handwriting	2005	2008
11	Handwriting	2005	2009
12	Handwriting	2005	2008
13	Handwriting	2004	2008
14	Handwriting	2004	2008
15 to 32	Handwriting	2006	2009
33 to 51,66	Signature	2006	2009
52 to 65	Handwriting	2006	2009
67 to 70	Handwriting	2006	2009

(b) Method of analysis

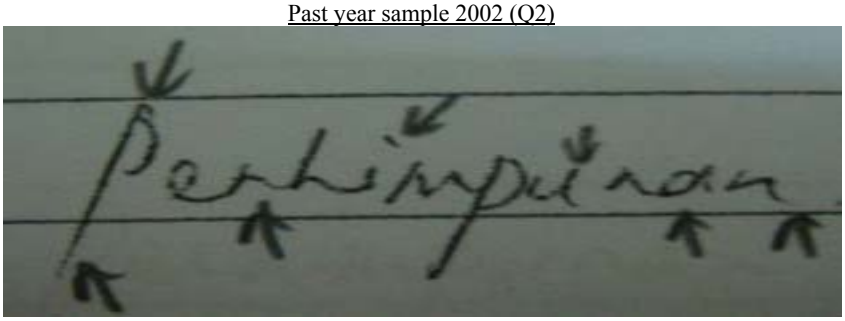
Magnifiers were used to compare the words and signatures and then comparison microscope was used for detailed examination. The next step is to record the samples. This was done by mean of scaled photography using a digital camera. The writings were cropped using Adobe Photoshop, enlarged 4 times its original size and were printed using laser printer have been prepared for comparison purposes. The original samples of signatures and writings were examined very carefully using hand magnifiers and the characteristics were identified and recorded. The characteristics were marked in enlarged prints of the writings obtained as stated before. Thus, the original samples were preserved as such to prevent damages and for future reference.

In the initial stage of examinations, words that revealed multiple characteristics were chosen for analysis. The identified characteristics were marked and photographed both from past and recent samples that were examined along side. Some of the finding after analysis i.e. attribution of authorship is as shown in **Table 2** and in **Fig. 1** to **Fig. 5**.

Table 2: Findings after comparing some of the handwritings and signatures

Samp No.	Fig No.	Type of sample	Type of retained individual characteristics	Findings after analysis
2	1	Handwriting	Design of letter, initiation, connection between letters, termination	Both the handwriting belong to the same person
3	2	Signature	design, connection, stroke and manner of dots	Both the handwriting belong to the same person
4	3	Handwriting	Letter design, connection between letters, termination	Both the handwriting belong to the same person
6	4	Handwriting	Design of letters, initiation, connection between letters, termination	Both the handwriting belong to the same person
66	5	Signature	Strokes, connection between letters, termination, idiosyncrasy (smiley)	Both the signatures belong to the same person

Past year sample 2002 (Q2)



Recent year sample 2008 (S2)

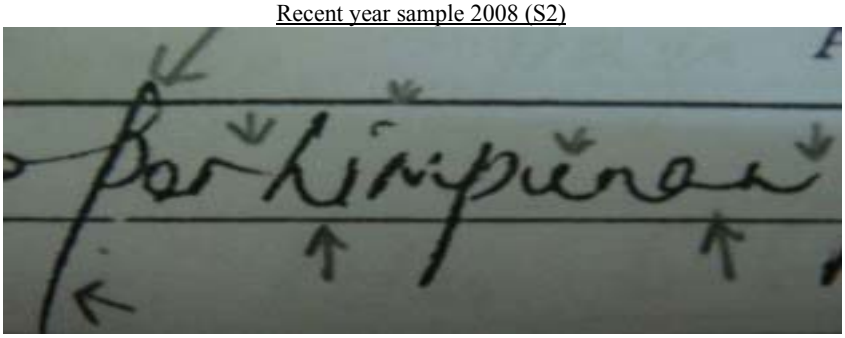
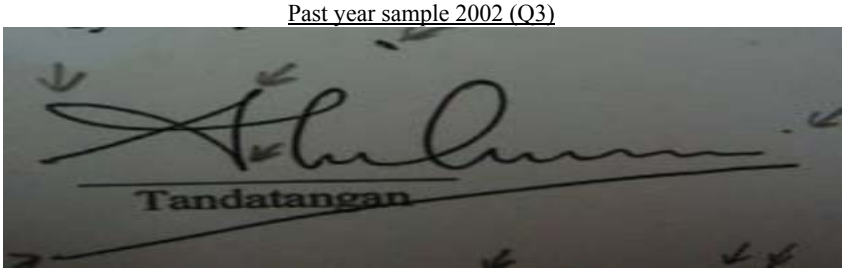


Fig. 1: Comparison of sample No.2 [Handwriting]

Fig. 1 is a handwritten Bahasa Melayu sample. The writings have been made in different years with a span of six years i.e. 2002 (presumed questioned) 2008 (presumed specimen). The basic and overall design of both the questioned and specimen samples showed similarity and these observed retention characteristics are indicated by arrows. The letters "P", "r", "u" and "a" present in the past and present samples showed retained individual characteristics.

Past year sample 2002 (Q3)



Recent year sample 2008 (S3)

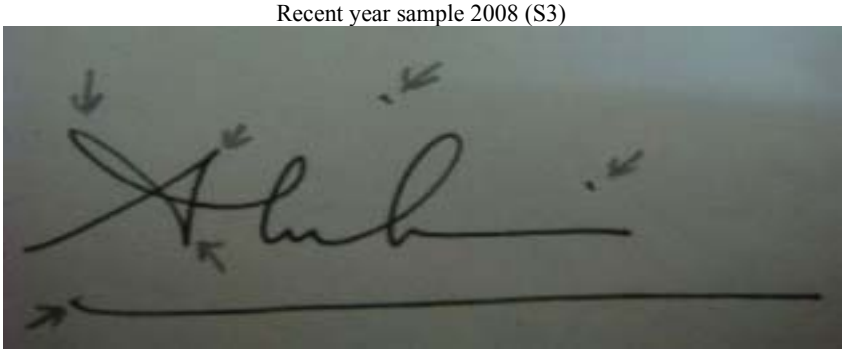
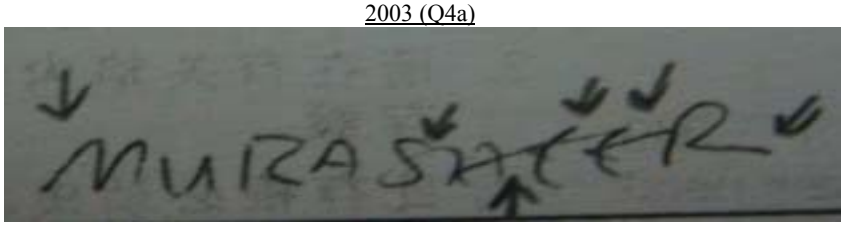
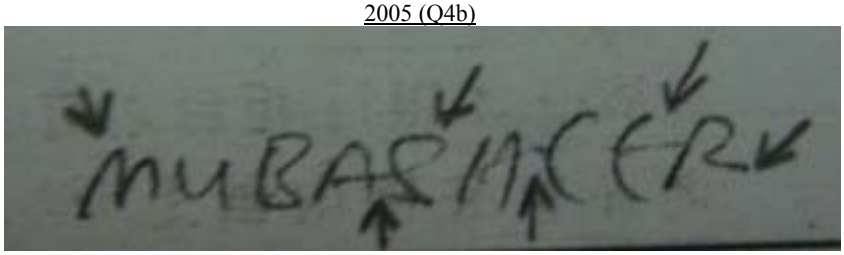


Fig. 2: Comparison of sample No.3 [Signature]

Past year sub-sample (Q4)
2003 (Q4a)



2005 (Q4b)



Recent year sample (S4)

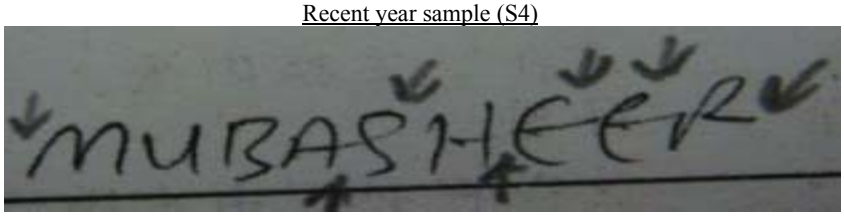
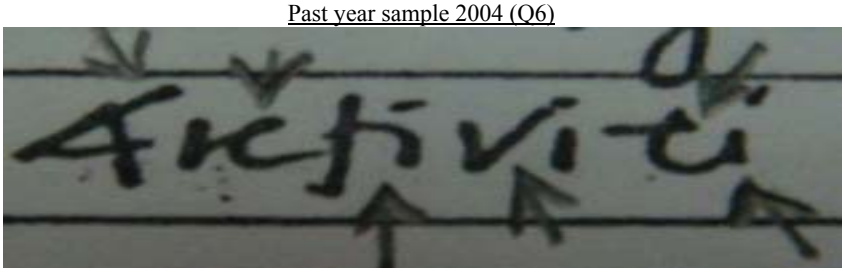


Fig. 3: Comparison of sample No.4 [Handwriting]

Past year sample 2004 (Q6)



Recent year sample 2008 (S6)

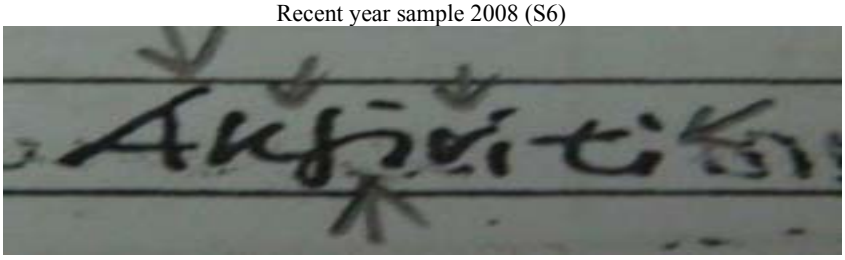
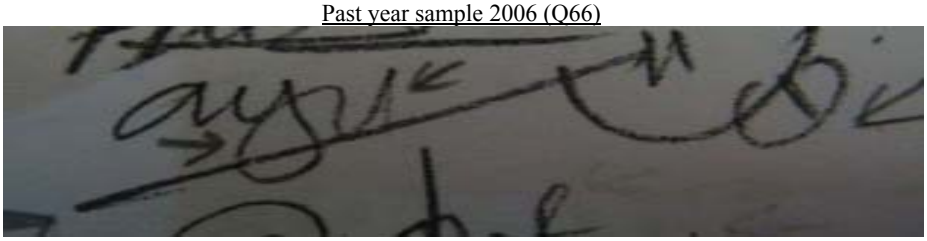


Fig. 4: Comparison of Sample No.6 [Handwriting]

Past year sample 2006 (Q66)



Recent year sample 2009 (S66)

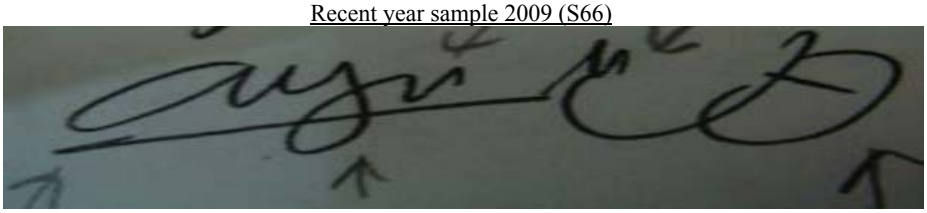


Fig. 5: Comparison of sample No.66 [Signature]

Results

All the present handwritings and signatures from S1 to S70 were found to retain sufficient number of individual characteristics, enabling comparison and attribution of authorship with the corresponding past handwritings and signatures. Some of the observed finding results were shown in the table 2. The table shows the sample number, the type of the sample (handwriting or signature), the retained individual characteristics which are identified (e.g. design, stroke and termination).

Discussion

The handwritings and signatures are valuable evidence in white collar offences during forensic document investigation. In the samples of signature, the retention of individual characteristics found to be more pronounced in the stroke, design, location of dots and connection. The characteristic retention in signature is an important factor because signature is one of the biometrics used for verification or identification. There is also a sample which show idiosyncrasy (sample 66) and it is retained which increased the probability of positive matching.

The minimum number of retained characteristics in one word for past handwritings after a lapse of ten years was 4 and maximum for the same ten years period was 9. Similarly the minimum number of retained characteristics in one word from handwritings after a lapse of two years was 9 and maximum for the same two years was 14 depending on the size of the samples. In general it is found that the lesser the number of years for the past writings, the more the number of retained characteristics. However even after ten years, the minimum number of retained characteristics for a word and signature observed here were found to be sufficient for attributing authorship indicating that the individual characteristics are sufficiently retained as a person become older. In this research, it is found that all seventy samples of signatures and writings showed retained individual characteristics in the recent year samples.

Conclusion

This research was conducted on seventy samples of handwriting and signatures to study the age related retention of individual characteristics and its forensic significance. The analysis was done on the individual characteristics that were normally assessed in forensics' handwriting analysis. From the study, it was found that even after ten years most of the individual characteristics are retained. Even though some changes were seen, still positive identification could be made by using the retained individual characteristics. This research indicated that individual characteristics such as initiation, stroke, design of letters, location of dots, connection between letters and termination are more frequently retained even as time progresses. This study indicated individual characteristics are found to be retained in handwriting and signature examination in spite of aging process.

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