# STATISTICAL EXAMINATION OF COMMON CHARACTERISTICS FOR DISGUISED HANDWRITING AMONGST MALAYSIAN

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*This report writing is dedicated to my beloved parents,*
*Mat Hazir Ahmad & Ropisah Abd Rahman and my family members,*
*to my adorable supervisors, Mdm. Rugayah Mohamed (UTM) and*
*Mr. Wong Kong Yong (JKM), and also to all my friends.*

*Thanks for everything*

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In the spirit of knowledge, I hope to provide useful inputs and remarkable insights for the readers in my research area.

## ABSTRACT

Every individual's style of handwriting is unique and has its own personalized touch. As an individual attempts to disguise their own handwriting with the intent of later disclaiming it, there is a need to perform examination of handwritten documents to determine the authorship of a questioned document or detect evidence of forgery or disguise. This research proposed a microscopic and statistical examination of handwriting characteristics. Two handwriting specimens were involved which are normal and disguised handwriting specimen forms. The normal handwriting of 60 respondents were examined and classified into class characteristic (script types, letter size, slant, angularity alignment and word spacing) and individual characteristic of letters "a", "e", "g", "y", "d", "f", "h", "o", "E" and "D" and grapheme "th". The other set of 50 sets of handwriting were requested for comparison between disguised and normal handwritings. A statistical technique known as Pearson Chi-squared ($\chi^2$) test was performed to determine the relationship between race, gender, age, first education system, education level and occupation with the normal habits of handwriting. The results show that the handwriting can be uniquely classified. Based on the Chi-squared ($\chi^2$) value, the script types were affected by gender ($\chi^2 = 0.009$) and age ($\chi^2 = 0.006$). The letter size and slant were only dependent on the factor of age ($\chi^2 = 0.022$) and education level ($\chi^2 = 0.034$), respectively. Angularity of handwriting was affected by the gender and education system. However, alignment and word spacing were not affected. During disguising their own handwriting, respondents tend to change the letter size, slant, initial capital letter and the speed of the writing, while the word spacing became inconsistent. Some person was really good in disguising the alphanumerical form but another person cannot disguise their handwriting as they maintained the script type of the writing.

## ABSTRAK

Tulisan tangan setiap individu adalah unik dan tersendiri. Individu menyamar tulisan sendiri dan tidak akan mengakui perbuatan tersebut. Oleh itu, penelitian dokumen tulisan tangan perlu dilakukan bagi mengenalpasti pengarang bagi dokumen palsu atau mengenalpasti bukti penyamaran. Kajian ini mengutarakan penggunaan teknik mikroskopi dan statistik dalam analisis tulisan tangan. Dua spesimen tulisan tangan digunakan iaitu spesimen tulisan tangan normal dan spesimen penyamaran tulisan tangan. Sebanyak 60 tulisan tangan normal telah dikaji dan telah diklasifikasikan mengikut kelas masing-masing (jenis tulisan, saiz, tahap kecondongan, bentuk tulisan, garis dasar dan jarak antara perkataan) dan ciri-ciri unik tulisan seperti huruf “a”, “e”, “g”, “y”, “d”, “f”, “h”, “o”, “E”, “D” dan “th”. Selain itu, perbandingan antara tulisan samaran dan tulisan biasa telah dijalankan ke atas 50 spesimen tulisan tangan yang lain. Kaedah statistik yang dikenali sebagai ujian Pearson Chi-squared ($\chi^2$) telah dilakukan untuk mengenalpasti faktor yang mempengaruhi habit pada tulisan tangan yang biasa. Keputusan menunjukkan bahawa tulisan tangan boleh diklasifikasikan secara unik. Berdasarkan kepada nilai Chi-squared ($\chi^2$), jenis tulisan tangan masing-masing dipengaruhi oleh jantina ($\chi^2 = 0.009$) dan umur ($\chi^2 = 0.006$). Saiz dan kecondongan perkataan hanya bergantung kepada faktor umur ($\chi^2 = 0.022$) dan tahap pendidikan ($\chi^2 = 0.034$). Bentuk tulisan tangan pula dipengaruhi oleh jantina dan sistem pendidikan. Walaubagaimanapun, garis dasar dan jarak antara perkataan tidak dipengaruhi oleh faktor-faktor yang dikaji. Semasa melakukan penyamaran terhadap tulisan tangan, individu cenderung untuk menukar saiz perkataan, kecondongan, huruf pertama dalam perkataan dan kelajuan semasa menulis, sementara jarak antara perkataan tidak konsisten. Sesetengah individu berjaya melakukan penyamaran tulisan tangan dengan baik dan sesetengah yang lain gagal.

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## LIST OF ABBREVIATIONS

| | | |
|---|---|---|
| ATR | - | Attenuated total reflection |
| ESDA | - | Electrostatic detection apparatus |
| FDEs | - | Forensic document examiners |
| FTIR | - | Fourier Transform Infrared |
| JKM | - | *Jabatan Kimia Malaysia* |
| MANOVA | - | Multivariate analysis of variance |
| SAS | - | Statistical analysis system |
| SEM | - | Scanning electron microscopy |
| SPSS | - | Statistical package for the social sciences |
| STATA | - | Statistic and data |
| VSC | - | Video spectral analyzer |

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# CHAPTER 1

# INTRODUCTION

## 1.1 Background Information

Every individual's style of handwriting is unique and has its own personalized touch. Handwriting is a movement habit that is very strong and individual. It is a mixture of what we have been taught and our personality (Sassoon and Briem, 1989). Handwritings fall into two general groups; class and individual characteristics. Class characteristics are actually common characteristics such as basic type of handwriting, slope of writing, line position and word spacing. The writing may result from such influences as the writing system studied, family associations, trade training and education (Hilton, 1983).

Individual characteristics are extremely rare in handwriting. Such characteristics actually would be found in only one person's writing and would be practically the only factor necessary to identify the writer. Some people like an Italic writing while others prefer a rounder writing with more upright hand. Some keep to the copperplate-based cursive of their late school days while still others have developed a quick, practical, personal hand styles to suit their own needs (Sassoon and Briem, 1989).

Handwriting is very difficult to disguise and forge, making handwriting analysis an effective tool for incriminating a suspect. Handwriting examination relies

upon a combination of principles used successfully for the past century, and techniques and technology that are at the leading edge of twenty first century. Common criminal charges involved in a document examination case include forgery, counterfeiting, identity theft, fraud or uttering a forged document. Many examinations in the document analysis involve a comparison of the questioned document or components of the document, to a set of known standards. The handwriting section of forensic science involves the comparing and authentication of written documents such as ransom notes, diaries, forged contracts, checks, forged wills, fake identity cards and passports and any other form of writing or printed material.

Questioned documents are often important because documents are used in different contexts and purposes. Almost any type of document may become disputed in an investigation or litigation. For example, a person may kidnap someone and forge a threatening note to the victim's family. This is an example wherein a document is produced directly as a fundamental part of a crime. Questioned document may be some material not normally thought of as a 'document'. 'Document' is defined in a very broad sense as being any material bearing marks, signs or symbols intended to convey a message or meaning to someone (Lindblom, 2006). This encompasses traditional paper documents but also includes things like handwriting on the mirror, graffiti on a wall, marks on doors, windows or boards, stamp impressions on meat products, or covert markings hidden in a written letter and other things.

Naturally, a handwriting expert knows all about handwriting such as how many different scripts there are now and in the past, how they have developed, how they are taught, how there are affected by difficult circumstances and why one person writes the way he does. However, the courts only concerned with identification of the author of a piece of questioned writing document, the recognition of simulated signatures and other related matters.

Thus, in order to identify the handwriting of an individual person, it is necessary to know how the writing of one person differs from that of another and

how the writing of one individual varies within itself. The most important is the study of what is found in writings on documents, how they can be examined to determine whether or not they have a common writer. It is not necessary to know why one person writes the way he does, nor to know how he was taught to write or what teaching methods are available, but some knowledge of these facts can be of assistance.

## 1.2 Problem Statements

For many centuries handwriting verification has been used for authentication purposes. Experts in forensic document analysis who are known as forensic document examiners (FDEs) all around the world daily perform examination of handwritten documents to determine the authorship of a questioned document or detect evidence of forgery or disguise.

Proving disguised handwriting on a document is a problem faced by many document examiners. By disguising his handwriting, an individual may hope to disclaim it at a later date, so as to exonerate himself from any consequences that may be linked to the document. For example, he may disguise his handwriting to write ransom note or anonymous document and then claiming that the document is not written by him.

As there is a lack of statistical data or any database concerning the specific handwriting characteristics and the occurrence frequency of combinations of particular handwriting characteristics, the identification of handwriting and the examination of questioned document becomes a more difficult task. The FDEs tend to assign the probative values to specific handwriting characteristics and their combinations while the judgments are often based almost entirely on their experience and power recall (Muehlberger *et al*., 1977).

Since handwritings identification is a scientific pursuit, statistical data concerning handwritings characteristics seem to offer some promise for providing a basis for the opinions of FDEs. Therefore, this research is designed to establish the types and differences of class and individual characteristics of Malaysian handwritings, to distinguish between normal and disguised handwritings and as the result, a useful set of standardized data of handwritings characteristics is formed.

## 1.3 Hypothesis Statements

The authentic or normal handwriting and disguised handwriting can be distinguished as the characteristics of individual handwriting differ from each other. Since, the style of handwritings of people in the same population is particularly likely to have class characteristics in common; the differences of handwriting between different racial groups of Malay, Chinese and Indian can be uniquely identified.

Handwriting of Malaysian tends to have three different styles. Handwriting of Indian could be more rounded than Malay handwriting while Chinese handwriting could be more oblong than Malay handwriting. In addition, young person with the age range below 30 like to write with printed style while person above 30 years old more interested in cursive handwriting. Person that always deal with writing documents prefer mixed and cursive handwriting.

During disguise handwriting a person prefer to enlarge their normal handwriting and like to change their style. The line quality could be more irregular, laborious, shaky and lack of rhythm, while the letter size tends to be larger, wider, higher and inconsistent than usual and there will be different spacing after caps. Some people like to change from printed type to cursive handwriting and vice versa.

## 1.4 Significance of the Research

Authorship identification in court cases usually involves disguised or forged handwriting. On the basis of selected handwriting characteristics, this study focused on normal handwriting of the general population and the common way to disguise handwriting. The informations gathered from this study will serve as a basis of handwriting classification of amongst Malaysian and ultimately helpful for forensic document examiners in private or government sector such as *Jabatan Kimia Malaysia* (JKM) in their routine work.

## 1.5 Objectives of the Research

The main objectives of this research are to analyze the handwriting characteristics and to examine the common characteristics of disguised handwritings amongst Malaysian. Details of the objectives are as follows:

a) To analyze and classify the handwritings characteristics based on class and individual characteristics.
b) To determine the common handwriting characteristics for disguised handwritings amongst Malaysian.
c) To distinguish between normal and disguised handwritings.
d) To organize the data statistically using Pearson Chi-squared ($\chi^2$) test.

## 1.6 Scope of the Research

This research involved the examination of the characteristics handwriting of multi-racial people in Malaysia. The characteristic features of handwriting selected

are such as the basic type of handwriting, slope of writing, line position or alignment, letter size, angularity and letter spacing. Several letters were selected due to their discriminating power which reflects individual characteristics.

Normal handwriting specimens were prepared to distribute to the selected respondents. Each specimen consists of control passages which incorporating alphabets in both lowercase and uppercase and numbers, and also consists of several questions regarding respondents' personal details. This research involved 60 participants, 20 participants from each race group of Malay, Indian and Chinese with the age range between 20 and 60.

Another set of 50 individuals were selected to study a comparison between normal and disguised handwritings. They were required to copy control passage for disguised handwriting, and repeating the writing three times. All the samples were collected and were analyzed using magnifier (90 mm diameter) and stereomicroscope equipped with camera and software capability for image measurements. The data then were rearranged and treated statistically using Pearson Chi-squared ($\chi^2$) test.

## 1.7 Outline of the Report

This report illustrates the informations concerning the handwriting characteristics amongst Malaysian and the common characteristics of disguised handwriting. Chapter 1 elucidates the research background and the importance strategies to respond the problems existed in current issue. Chapter 2 presents the literature search regarding this study which contains information of the whole research done. The experimental methodology used in this research is described in Chapter 3 while the results and discussion of the usual handwritings characteristics and the common ways people like to disguise handwritings are explained in Chapter 4. Finally, Chapter 5 summarizes the results obtained with recommendation for future work.