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A study on the handwriting characteristics of Doctors on prescription and exemplar writings in Mangaluru City, India

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Abstract

It is a common assumption among the public that doctor's prescription writing is completely illegible and their normal writing is much better compared to their prescription writing. Due to the illegibility of the prescription writing among doctors, most of the patients find it hard to understand the medicines or any other details written in the prescription for them. This study aims to find out whether there is any variation between the handwriting of doctors in prescription and their standard or exemplar writings. The objectives of the study are to study the variation in class characteristics of handwriting among prescriptions of doctors and to know the dissimilarities in class characteristics of handwriting among exemplar writings of doctors. Also to identify if there are any similar handwriting characteristics maintained in doctor's prescriptions and exemplar writings and to compare the handwriting characteristics of doctor's prescription with that of exemplar writings. Handwriting samples were collected from 50 doctors in Mangaluru city. Three exemplar samples were collected from each doctor by dictating a content to them and similarly three prescription writing samples were also collected from each doctor. The study concludes that the variation in handwriting among the prescription and exemplar writings of doctors are less compared to the similarity which is found to be more in the samples.

Keywords: Prescription writing, exemplar writing, handwriting characteristics, class characteristics, individual characteristics, doctor's handwriting characteristics.

Introduction

People present themselves to the world through their handwriting and are inevitably judged by it. From our earliest school days, success and failure are often measured in terms of neat handwriting[1]. Handwriting is a complex perceptual–motor skill encompassing a blend of visual–motor coordination abilities, motor planning, cognitive, and perceptual skills, as well as tactile and kinesthetic sensitivities[2]. As handwriting is so common and essential to daily communication, handwriting analysis is a crucial component of forensic document analysis. It can be used for a variety of analyses, including, identifying potential writers of ransom letters and verifying the legitimacy of certain documents. When such cases arise Forensic Document Examiners can confirm or refute the identity of the writer, by comparing the handwriting to known specimens belonging to the mentioned individual. Writing characteristics (i.e., habits) have been commonly described as being of one of two types: class characteristics (the products of prescribed writing systems) and individual characteristics (the particular idiosyncrasies of the individual)[3].Not all characteristics encountered in document examination are peculiar to a single person or thing, and one that is common to a group may be described as a class characteristic[4].Some of the Class characteristics that are used for handwriting analysis are: Alignment, Movement which includes Finger, Wrist and forearm movement, Pen pressure, Speed, Shading, Spacing, Pen position, Line quality, Size and Slant/slope. Writer individuality rests on the hypothesis that each individual has consistent handwriting that is distinct from the handwriting of another individual[5]. Individual characteristics occur when a letter departs from its usual copybook form. These elements of writing constitute the basis of all handwriting identifications and include such features as the size of letters, the ratio of parts of a letter to the letter as a whole, unusual pen lifts, and the misalignment of letters relative to the baseline, to name just a few[6]. The ability to distinguish between class characteristics and individual characteristics is widely believed to be one of the fundamental bases by which a document examiner can make judgments and form opinions to distinguish one person's writing from another[7].For the purpose of analysing the handwriting as explained above, Forensic Handwriting examiners collect various samples for the purpose of examination. Two classes of specimens can be relied upon to fulfill these requirements. One consists of writing executed in day-to-day course of business, social, or personal affairs. These specimens may be referred to as collected standards. The second class consists of material written at the request of an attorney, investigator, or the FDE for the sole purpose of conducting a comparison with the questioned documents — commonly known as request or dictated standards[6]. It is produced under strictly regulated circumstances, and the author is attentively watched. It is also called as Exemplar handwriting samples.

When it comes to handwriting examination, Principles of handwriting serve as the foundation for the concepts of handwriting identification. Among these scientific facts, the most fundamental one is that no two people's handwriting is precisely the same in a handwriting sample. It is feasible to use a signature in financial and legal operations since each person's handwriting is unique and cannot be confused with any other handwriting. Document examiners can distinguish between authentic and fraudulent writing using this approach, which also helps them determine who wrote a sample of handwriting. The second principle regarding handwriting is that every writing has a range of natural variation, meaning that no two samples of writing from the same author will be precisely same. Every hand writing characteristic has a small variation. The document examiner needs to develop the ability to discern between a different writer and natural variance. Writing is a complex act and requires high level of skill. No person can exceed his or her writing skill. Each person's writing skill is shaped by a variety of factors, which culminates in their individual writing style. The writer is influenced by these things for the rest of their life[8].Two classes of writing standards are utilized for comparison purposes. These are non-request writing, also known as spontaneous or undictated writing, and requested writing or dictated exemplars. The non-request or undictated writing is the material written by the individual during the everyday course of business and is likely to reveal the normal writing habits of the individual. Requested exemplars are standards written at the request, and usually in the presence, of the investigator or examiner[9]. As per the literature review, the studies collectively highlight the urgent need for the accurate recognition of doctor's handwritten prescriptions to reduce medical errors and improve healthcare delivery[10-17]. Studies highlight the importance of standardized prescription writing practices and training at the Undergraduate level to reduce errors in prescription[18-23]. After reviewing the literatures related to the research topic, it was found that the studies done in the field did not focus on the individual handwriting characteristics of doctors. Hence, for better understanding of the handwriting characteristics, both prescription and exemplar handwriting samples must be collected and the class and individual characteristics in these samples needs to be analyzed.

Materials and Methods

Objectives: The present study is taken up with the following objectives such as to study the variation in class characteristics of handwriting among prescriptions of doctors, to know the dissimilarities in class characteristics of handwriting among exemplar writings of doctors, to identify if there are any similar hand writing characteristics maintained in doctor's prescriptions and exemplar writings and to compare the handwriting characteristics of doctor's prescription with that of exemplar writings.

Research Design: Experimental research design is adopted here with the purpose to study the Handwriting Characteristics of Doctors on Prescription and Exemplar Writings in Mangaluru City, Karnataka.

Participants: Both male and female doctors belonging to the jurisdiction of Mangaluru city in Karnataka, India have been selected. The sample size of the study is 50 and 3 samples of prescription and 3 samples of exemplar writings were collected from each doctor.

Procedure of data collection: Researcher has approached doctors from different clinics and hospitals. After explaining the aim and objectives of the study, a consent form has been provided to the subject and once they have read through the form, they were asked to sign the consent form and the researcher has also signed the same. The exemplar writings from the doctors were collected by dictating the same content to each doctor 3 times to collect 3 samples. 3 prescriptions were also collected from the doctors in order to study the handwriting characters of doctors in prescription and exemplar writing. The exemplar and prescription writing where then checked for class and individual characteristics.

Data Analysis: The class characteristics that were considered for the study are: Size, Spacing, Slant, Speed, Skill, Line quality, Alignment, Pen pressure. The individual characteristics that were considered for the study are: Initial strokes, terminal strokes, number of loops and crossbar of 't'. Then the data has been collected, coded and entered in Microsoft Excel. Further, the data has been presented in the form of bi-variate tables and analyzed using Chi square test.

Results and Discussion

Class Characteristics of Handwriting in Doctor's Prescription: Table-1 pertaining to the total occurrence of similarity and dissimilarity found during the analysis of prescription written by each doctor indicates that majority, that is 100 percent of the doctors have shown similar spacing between letters while 90 percent of the doctors show similar pen pressure in their handwriting. Further, 50 percent of doctors have shown dissimilarity in the slant in handwriting and 46 percent of doctors have shown variation in Alignment.

The total number of prescription samples analyzed were 50. After analysis of Table-1, it indicates that there were 359 similarities in class characteristics and 141 dissimilarities were found.

The expected frequency for the values represented in Table-1 are 35.9 for similarity and 14.1 for dissimilarity respectively for all of the handwriting characteristics such as size, spacing between lines, letters and words, slant, speed, skill, line quality, alignment and pen pressure.

Class Characteristics of Handwriting in Exemplar Writing of Doctors: Table-2 is the tabular representation of the total

occurrence of similarity and dissimilarity found during the analysis of exemplar writing by each doctor indicates that the greatest number of similarities that is 100 percent of the doctors have shown similar spacing between letters and 88 percent have shown similarity in the size of their handwriting. Furthermore, considering dissimilarities majority, that is 48 percent have shown dissimilarity in size as well as slant in their writing. Additionally, 38 percent of the doctors have shown variation in the spacing between the lines.

The total number of samples analyzed were 50. After analysis, from the Table-2, it indicates that there were 367 similarities in class characteristics and 133 dissimilarities were found.

The expected frequency for the values represented in Table-2 are 36.7 for similarity and 13.3 for dissimilarity respectively for all of the handwriting characteristics such as size, spacing between lines, letters and words, slant, speed, skill, line quality, alignment and pen pressure.

Table-1: Similarities and Dissimilarities in Class Characteristics of Handwriting in Doctor's Prescription.

Class Characteristics	Similar	Dissimilar	Total	% Similar	% Dissimilar
Size	44	6	50	88%	12%
Spacing between lines	29	21	50	58%	42%
Spacing between letters	50	0	50	100%	0%
Spacing between words	30	20	50	60%	40%
Slant	25	25	50	50%	50%
Speed	34	16	50	68%	32%
Skill	35	15	50	70%	30%
Line quality	40	10	50	80%	20%
Alignment	27	23	50	54%	46%
Pen pressure	45	5	50	90%	10%
Total	359	141	500		

Table-2: Similarities and Dissimilarities in Class Characteristics of Handwriting in Exemplar Writing of Doctors.

Class Characteristics	Similar	Dissimilar	Total	% Similar	% Dissimilar
Size	44	6	50	88%	12%
Spacing between lines	31	19	50	62%	38%
Spacing between letters	50	0	50	100%	0%
Spacing between words	34	16	50	68%	32%
Slant	26	24	50	52%	48%
Speed	41	9	50	82%	18%
Skill	26	24	50	52%	48%
Line quality	41	9	50	82%	18%
Alignment	30	20	50	60%	40%
Pen pressure	44	6	50	88%	12%
Total	367	133	500		

Analysis of Individual Characteristics of Handwriting Samples: From the following figures, Figure-1 and 2 shows the comparison of initial stroke characteristics of exemplar and prescription writing. The initial strokes were mostly found to be similar among most of the exemplar as well as prescription samples. In the Figure-1 and 2, the initial stroke has a tiny hook and very light pen pressure. Similarly, the Figure-3 and 4 shows the comparison of terminal stroke characteristics of exemplar and prescription writing. The terminal stroke in both exemplar as well as prescription samples are projecting out with light pen pressure. Further, the Figure-5 and 6 shows the comparison of loop characteristics of exemplar and prescription writing. The loops as observed in the figures are elongated and directly connecting with the next letter which is found similar among both the samples. Meanwhile, the Figure-7 and 8 shows the comparison of crossbar of 't' characteristics of exemplar and prescription writing. As observed in the figures, the crossbar of 't' is prominent towards the left side in both the prescription as well as exemplar samples.

Figure-1: Initial Stroke in Exemplar Writing.

Figure-2: Initial Stroke in Prescription Writing.

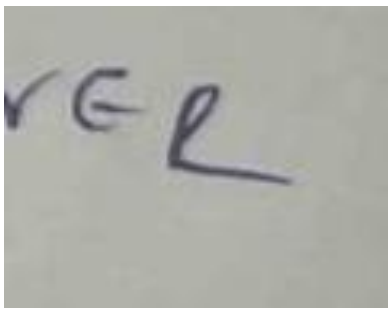

Figure-3: Terminal Stroke in Exemplar Writing.

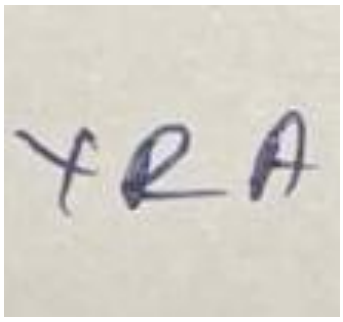

Figure-4: Terminal Stroke in Prescription Writing.

Figure-5: Loop in Exemplar Writing.

Figure-6: Loop in Prescription Writing.

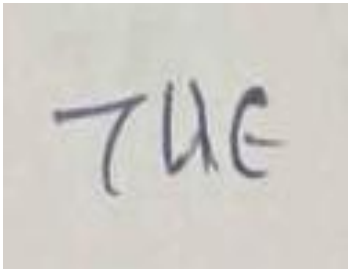

Figure-7: Crossbar of 'T' in Exemplar Writing.

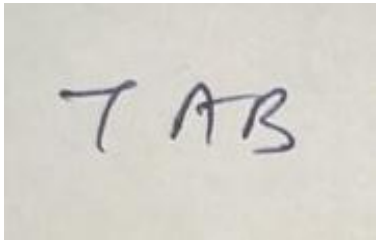

Figure-8: Crossbar of 'T' in Prescription Writing.

Inferential Statistics: Chi Square Test: The chi-square test value for class characteristics among prescription of doctors is:

$X^2 = 64.9$

The chi-square test value for class characteristics among exemplar writing of doctors is:

$X^2 = 61.72$

The chi-square test (x^2) value of the samples obtained from class characteristics among exemplar and prescription writing of doctors are 64.9 and 61.72 respectively. The chi-square table value for the samples obtained from class characteristics among exemplar and prescription writing of doctors with the degree of freedom 9 for the level of significance 5% ($\propto = 0.05$) is 16.919. Since the calculated value is more than table value, it indicates that the null hypothesis cannot be accepted. That is, there is significant similarity in the class characteristics of exemplar and prescription writing among doctors.

Discussion: The present study clearly indicates that there are more similarities among the prescription and exemplar samples compared to the dissimilarities. Comparing with the past studies done among handwriting samples of doctors, from the specific universe chosen by the researcher the handwriting samples were comparable and showed majority of similarities in the characteristics. The major similarities among the class characteristics in prescription writings are spacing between letters (100%) and pen pressure (90%), while characteristics like spacing between lines (50%) and alignment (46%) show more dissimilarities. In exemplar writings, characteristics such as slant (48%) and skill level (48%) show more variability compared to characteristics such as spacing between letters (100%) and pen pressure (88%), that are consistently similar across the samples. Individual characteristics like initial strokes, terminal strokes, loops and crossbar of 't' were considered as they are more commonly maintained among the samples. Individual characters like initial strokes and loops show higher consistency compared to characteristics such as terminal strokes and crossbar of 't' among prescription writings and characters such as initial strokes and crossbar of 't' show higher consistency compared to characteristics such as loops and terminal strokes in exemplar writings.

The chi square value for the class characteristics for prescription and exemplar writings in doctors were obtained as 64.9 and 61.72 respectively. The chi square table value for the samples obtained from class characteristics among exemplar and prescription writing of doctors with the degree of freedom 9 for the level of significance 5% ($\propto = 0.05$) is 16.919. Since the calculated value is more than table value for both the class as well as individual characteristics, it indicates that the null hypothesis cannot be accepted. That is, there is significant similarity in the class characteristics of exemplar and prescription writing among doctors.

Conclusion

The purpose of the present study was to find out whether there is any variation among the exemplar and prescription writings of doctors. From the analysis the researcher found that there are maximum numbers of similarities in class and individual characteristics in both exemplar as well as prescription writing of doctors. These similarities lead to the conclusion that doctors maintain their handwriting in both exemplars as well as prescription writings.

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