

A Comparative Study of Different Blood Alcohol Concentration Effect on Handwriting

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Abstract

Handwriting is a visible speech which is not spoken but written. There are various internal and external factors that might cause variation in handwriting. This research work has been conducted to evaluate various graph logical features of handwriting after alcohol consumption. The evaluation on similarity and dissimilarity in normal and intoxicated writing showed that the shape independent features show significant variation in the following features such as misspelling, hesitation, rhythm, line quality, tremors and size in the handwriting of the individuals in their pre and post intoxicated stage. However the formation and other internal characteristics remain similar independent of intoxication. The result shows the pre and post changes of intoxication.

Keywords: Forensic Science; Questioned Document; Breath Analyzer

Introduction

Handwriting is a neuromuscular task and helpful sources in many criminal offences and has been the subject of expert study. The handwriting examination is related to observational learning and practical experience. It is called as unique writing that determines writer calligraphy and that is identifiable because of the presence of class characteristic features and giving the writer individuality on the basis of its master handwriting pattern. It is a neuro-muscular task which originates in the mind as a mental picture but natural variation is the major factor which does not allow the exact duplication of image generated in mind on paper because of its inevitable nature which indirectly gives the authenticity to handwriting. It is outlined as the imprecision with whom the habits of a writer are executed on repeated occasions. Preliminary examination of handwriting is done of a disputed document to find out whether the document is fit for detailed examination or not usually the document is checked for any kind of forgeries, disguise, tampering with them [1-5]. The questioned examination is done to find out the authenticity, adequacy and integrity of the input materials and lays down the foundation for detailed examination. The penmanship is analysed by comparing the questioned and the standard writing for class characteristics and the individual characteristics to prove the identity of a person. Some of the class characteristics involve Line Quality, Skill, Size & Proportion, Spacing, Slant, Rhythm, Alignment, Movement, etc. When the writings are closely examined, some basic differences allow the individualisation of the handwriting. These characteristics are the most important factors to determine the penmanship [6-9]. These individual characteristics involve Letter formation, Connecting Strokes, Embellishments, Initial and Terminal strokes and any peculiar and unique style of writing. Osborn et al. suggested phenomenon of distinguishing different system of writing using proportion of letters as an element Computation of average heights and widths of letter combinations [10]. Writing is a complex task brain guides hand everything put on paper is a result of a two- way circuit between brain and the motor reflex muscles of hand.

Justification

The justification for this research work is in the cases of document forgeries Signature forgeries, testamentary will forgeries and cheque forgeries and so on. It is claimed that a particular document has not signed by the alleged person or when the signature was obtained the person has no knowledge of it because of the intoxication or under alcoholic effect. The dosage of intoxication leads to the imblancement of our nervous control and causes affect to our physiological mechanism of writing which corrupt the formation of the letters and leads to the irregularity in the formation of class characteristics of handwriting as this class characteristics gives uniqueness to every wordsmith possess a natural master pattern of writing that changes from sober to unsobber writing due to the intoxication dosage. This research work has been conducted to evaluate the features that show highest deterioration during the drunkenness stage of the writer at different blood alcohol concentration. On the basis of various selected graphological features of handwriting. The dosage of intoxication play major role in corrupting the graphological features of handwriting and helps in the discrimination of the handwriting of the writers at different blood alcohol concentration.

Objective

To conduct a comparative study of different blood alcohol concentration effect on Handwriting.

Research Methodology

Sources of Data

Handwriting samples for the analysis were collected from the bar, disc, pub and parties of new Delhi region. There were total 100 samples which were collected with given consent form at the time of the conscious stage of the writer in which they have to write the same paragraph which was given. For the comparative study of different blood alcohol concentration effect on handwriting. The alcohol brands were not selected this study is entirely based on the calculated blood alcohol concentration vol/vol. Respondents were intoxicated with alcohol and the samples were taken after 1 hour of consumptions of their drinks after determining their blood alcohol concentration with breath analyser.

Categorization

The Respondents were categorised on the basis of blood alcohol concentration vol/vol [1]. Type 1- 0- 25% blood alcohol concentration vol/vol.

- Type 2- 50-70% blood alcohol concentration vol/vol.

Preliminary Examination of the Handwriting samples: The eleven handwriting features were analysed which are as follows.

- Rhythm- Rhythmic/non rhythmic.
- Word alignment - Even/uneven.
- Line quality- poor/smooth.
- Hesitation- Present/absent.
- Pictorial effect- Skilled/unskilled.
- Spacing- Present/absent.
- Misspelling- Present/absent.
- Tremors-Present/absent.
- Connecting strokes-Connected/disconnected.
- Size- Small/large/medium.
- Slant- Left/ right/vertical.

Statistical tool: Chi square test is used to analyse and interpret the data.

Results and Discussion

S. No.	Features	Blood Alcohol Concentration	
		(0-25% v/v)	(50-70% v/v)
Frequency		N-50	N-50
1	Slant	19	32
2	Tremors	17	35
3	Connecting strokes	35	44
4	Alignment	32	38
5	Size	44	48
6	Spacing	36	39
7	Pictorial effect	42	45
8	Misspelling	37	39
9	Line quality	40	46
10	Rhythm	33	38
11	Hesitation	29	37

Table 1: Frequency of the affected features of handwriting at different blood alcohol concentration

The eleven features were selected to further analyse the natural variation of the handwriting in their intoxicated stage at highest and lowest alcohol level of the writer. The frequency of the sample is homogenous (n-50) (Table 1).

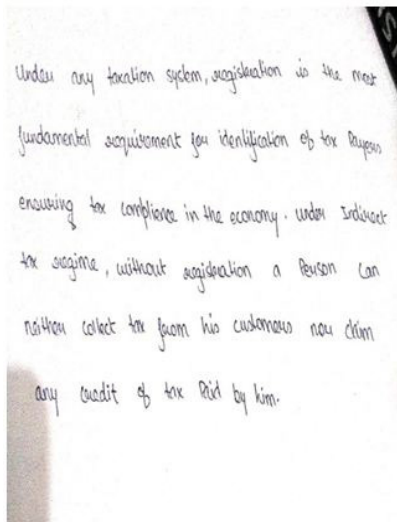
Table 2 represent the statistical value of the characteristics features found in the handwriting sample of intoxicated writers at lowest (0-25%v/v) and highest (50-70%v/v) blood alcohol concentration. The result found that at the range of (0-25%) of alcoholic level the affected significant features found in the handwriting were Spacing, Line quality, Connecting strokes, Size, Pictorial effect, Misspelling, Leaving the features such as slant, Alignment, Tremors and Rhythm found to be unaffected or non-significant. Whereas at the highest range (50-70%v/v). Except slant all the ten features found to be significant or affected.

S. No.	Features	x ² Blood alcohol concentration	
		(0-25% v/v)	(50-70% v/v)
Frequency		N-50	N-50
1	Slant	1.44	1.96
2	Tremors	2.56	4
3	Connecting strokes	4	14.44
4	Alignments	0.64	6.76
5	Size	14.44	21.16
6	Spacing	4.84	7.84
7	Pictorial effect	11.56	16
8	Misspelling	5.76	7.84
9	Hesitation	0.64	4
10	Line quality	9	17.64
11	Rhythm	2.56	6.76

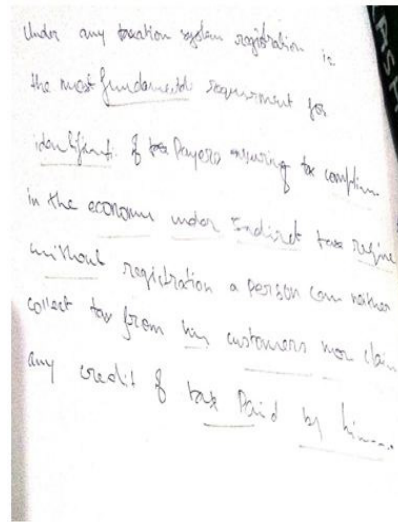
*(Level of Significant value-99.5)

Table 2: Chi square value table at different blood alcohol concentration

Rhythm



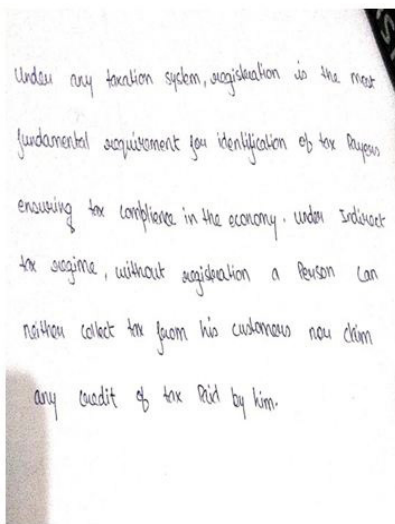
(a) Rhythmic (pre)



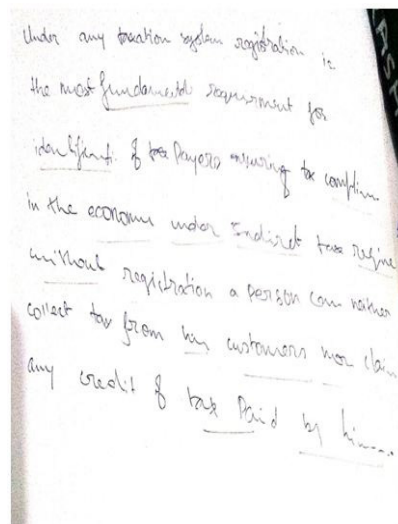
(b) Non- rhythmic (post)

Figure 1: Handwriting sample of the individual writer (a) It shows rhythmic handwriting before intoxication; (b) shows the difference in handwriting as non-rhythmic because of the administration of the dosage of intoxication or alcohol of the writer

Alignment



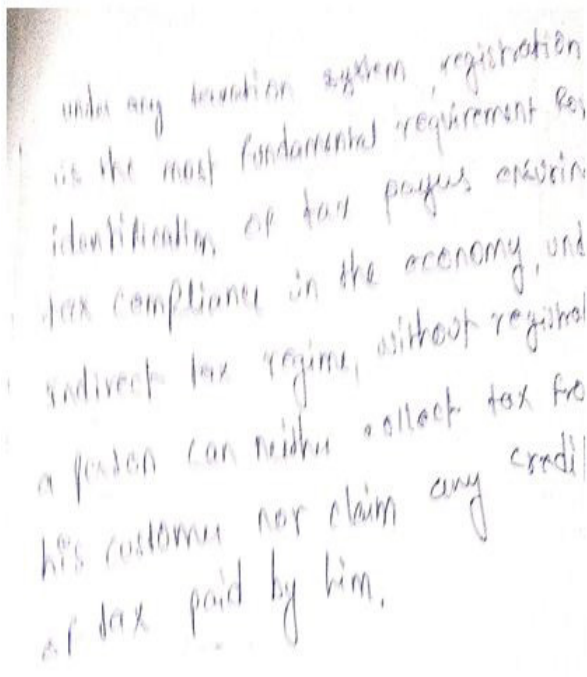
(a) Even alignment (pre)



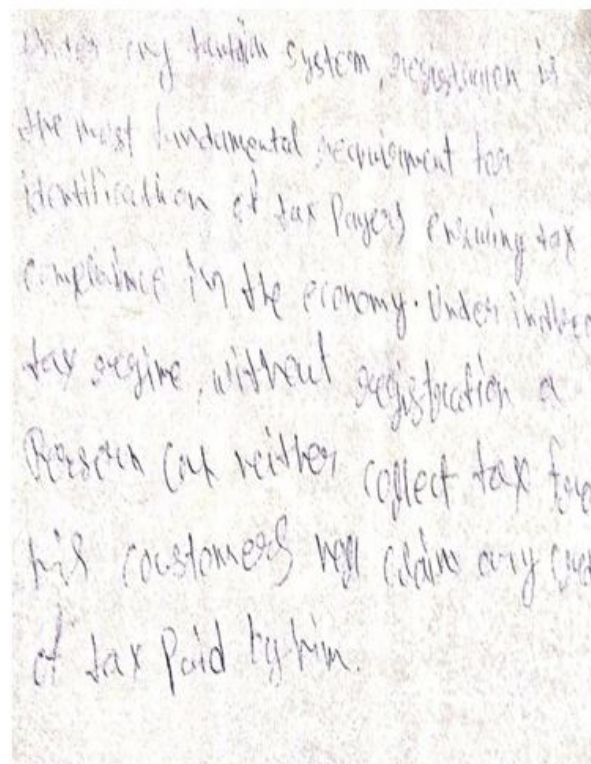
(b) Uneven alignment (post)

Figure 2: Handwriting sample of the individual writer (a) shows even alignment of writing before intoxication; (b) shows the difference as uneven alignment of the writing because of the administration of the dosage of intoxication or alcohol of the writer

Connected Stroke



Under any taxation system, registration is the most fundamental requirement for identification of tax payers ensuring tax compliance in the economy, and indirect tax regime, without registration a person can neither collect tax from his customer nor claim any credit of tax paid by him.



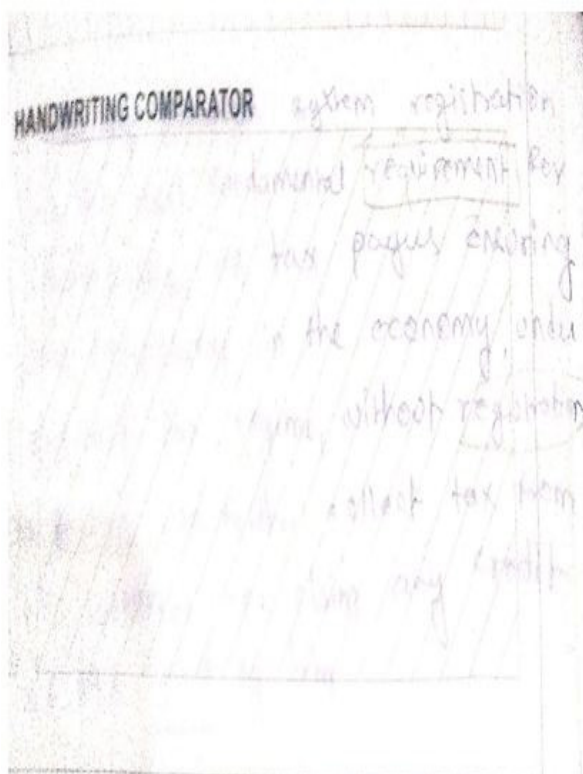
Under any taxation system, registration is the most fundamental requirement for identification of tax payers ensuring tax compliance in the economy. Under indirect tax regime, without registration a person can neither collect tax from his customer nor claim any credit of tax paid by him.

(a) Connected strokes (pre)

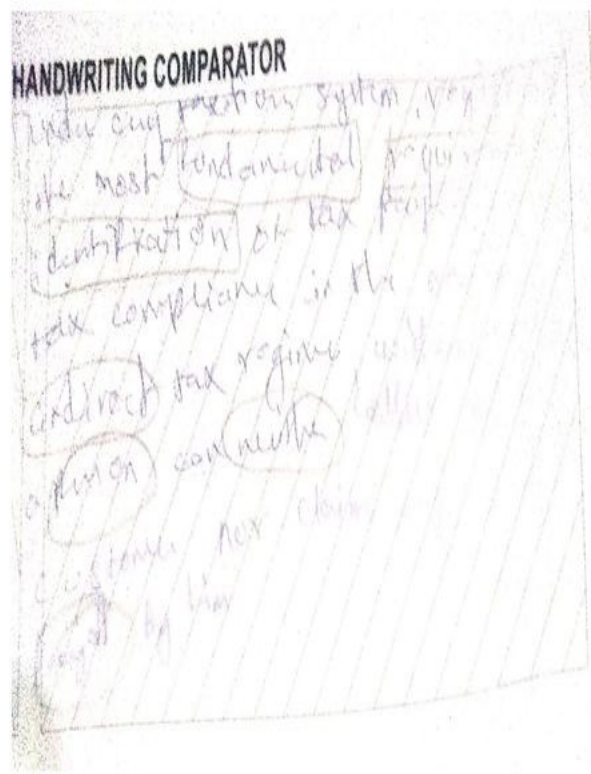
(b) Disconnected stroke (post)

Figure 3: Handwriting sample of the individual writer (a) shows connected strokes in writing before intoxication of the writer; (b) shows the difference in handwriting as disconnected stroke found in the writing because of the administration of the dosage of intoxication or alcohol of the writer

Slant



HANDWRITING COMPARATOR
Under any taxation system, registration is the most fundamental requirement for identification of tax payers ensuring tax compliance in the economy, and indirect tax regime, without registration a person can neither collect tax from his customer nor claim any credit of tax paid by him.



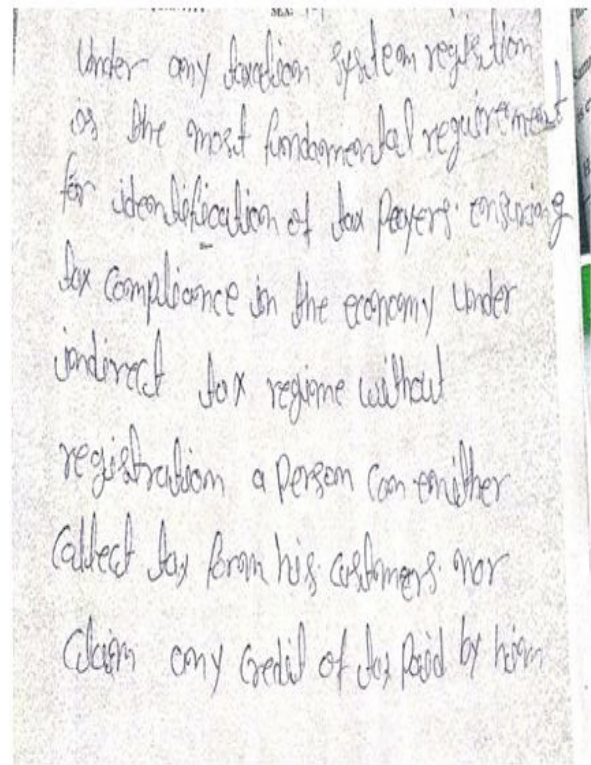
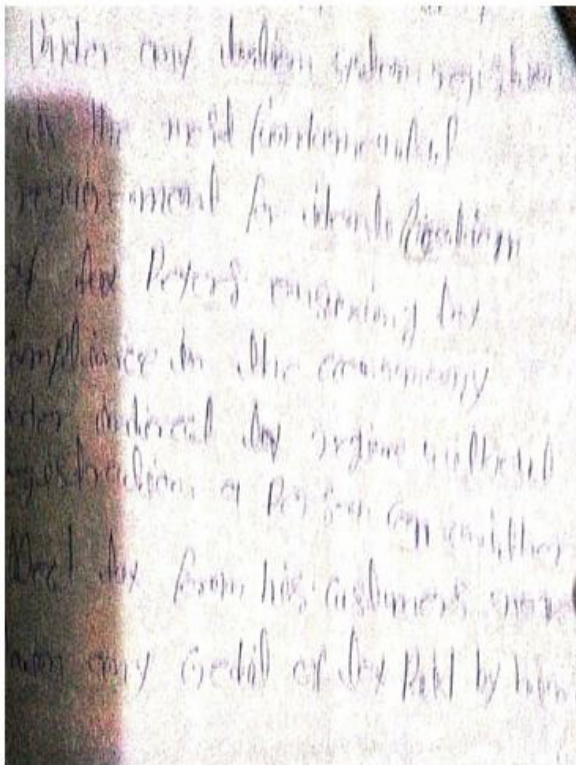
HANDWRITING COMPARATOR
Under any taxation system, registration is the most fundamental requirement for identification of tax payers ensuring tax compliance in the economy, and indirect tax regime, without registration a person can neither collect tax from his customer nor claim any credit of tax paid by him.

(a) Right hand slant (pre)

(b) Left hand slant (post)

Figure 4: Handwriting samples of the individual writer (a) Shows right hand slant in writing before intoxication of the writer; (b) Shows that the slant changes from right to left hand slant in the handwriting because of the administration of the dosage of intoxication or alcohol of the writer

Size

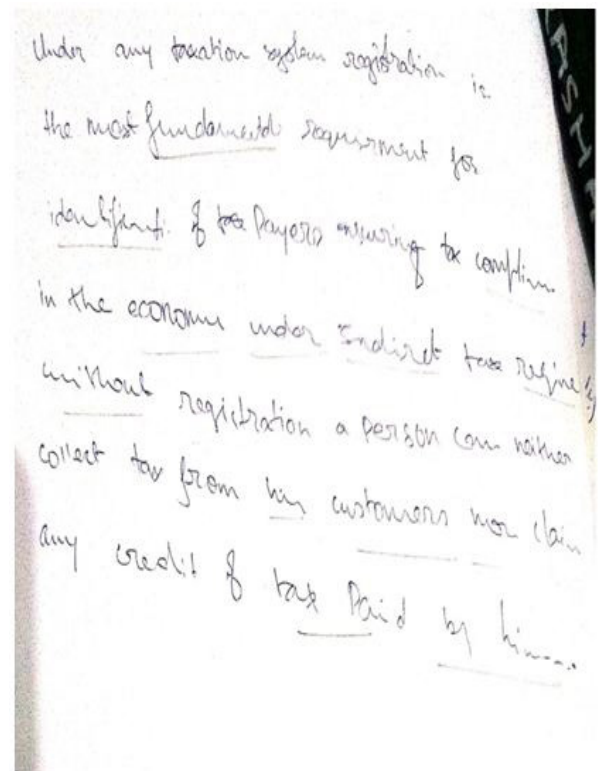
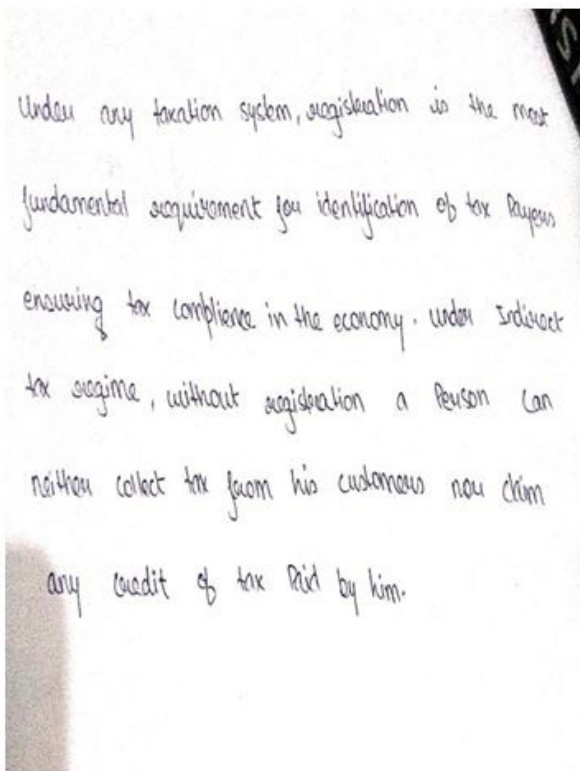


(a) Size Medium (pre)

(b) Size Large (post)

Figure 5: Handwriting sample of the individual writer (a) Shows that size of the letter is medium before intoxication of the writer; (b) Shows that that size of the letter changes and increases from medium to large in the handwriting because of the administration of the dosage of intoxication or alcohol of the writer

Line Quality

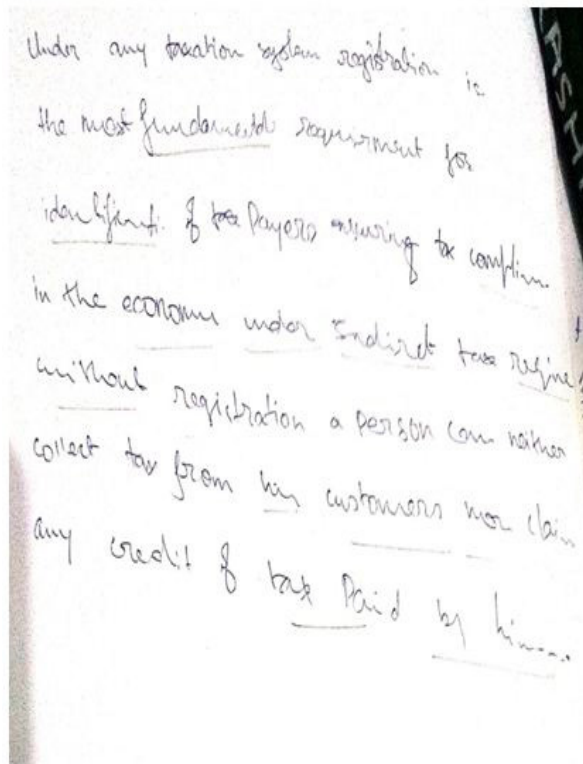
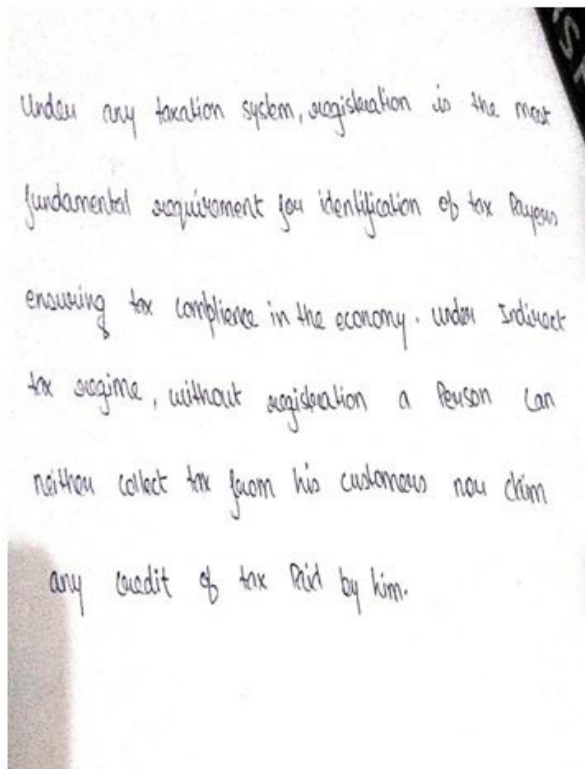


(a) Line quality Smooth (pre)

(b) Line quality Poor (post)

Figure 6: Handwriting sample of the individual writer (a) Shows that the Line quality is smooth before intoxication of the writer; (b) Shows that the line quality that changes from smooth to poor in the handwriting because of the administration of the dosage of intoxication or alcohol of the writer

Pictorial effect

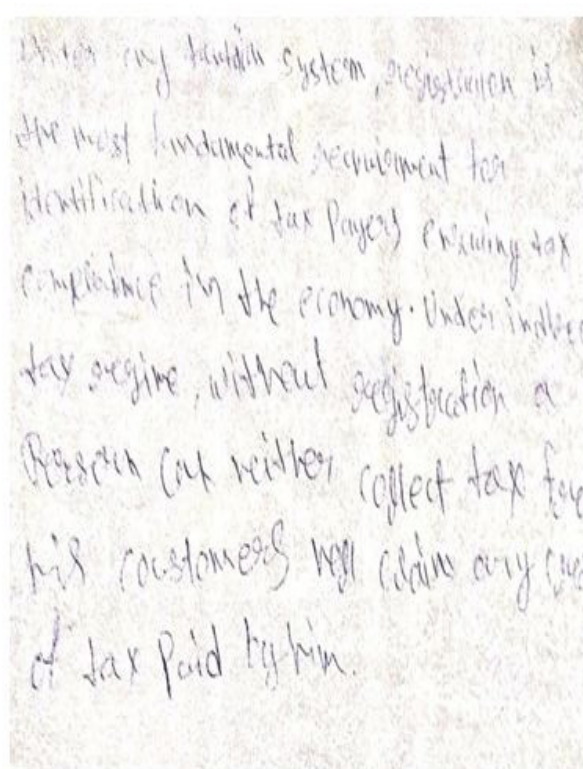
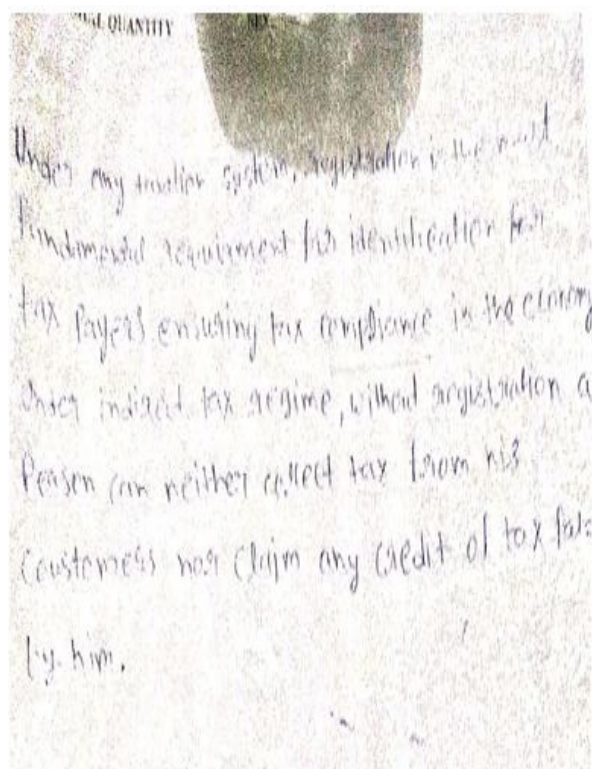


(a) Pictorial effect Skilled (pre)

(b) Pictorial effect unskilled (post)

Figure 7: Handwriting sample of the individual writer (a) Shows that the line quality is smooth and gives the writing its pictorial effect as of skilled writer before intoxication; (b) Shows that the line quality changes smooth to poor in the handwriting and gives the writing its pictorial effect as of unskilled writer because of the administration of the dosage of intoxication or alcohol of the writer

Tremor



(a) Tremor absent (pre)

(b) Tremor present (post)

Figure 8: Handwriting sample of the individual writer (a) Shows that the tremor is absent before intoxication of the writer; (b) Shows that the tremor is present because of the administration of the dosage of intoxication or alcohol of the writer. That corrupts the formation of the letter and causes clumsiness and deviation from straight line of the writing

Misspelling

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(a) Misspelling absent (pre)

(b) Misspelling present (post)

Figure 9: Handwriting sample of the individual writer (a) Shows that the misspelling is absent before intoxication of the writer; (b) Shows that the misspelling is present because of the administration of the dosage of intoxication or alcohol of the writer. That corrupts the formation of the letter and causes clumsiness and deviation from straight line of the writing

Hesitation

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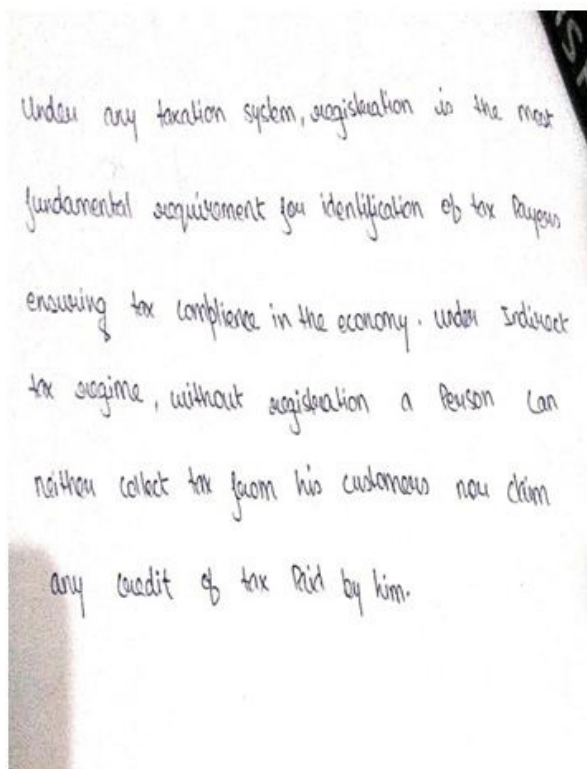
Under any taxation system, registration is the most fundamental requirement for identification of tax payers ensuring tax compliance in the economy. Under indirect tax regime, without registration a person can neither collect tax from his customer nor claim any credit of tax paid by him.

(a) Hesitation absent (pre)

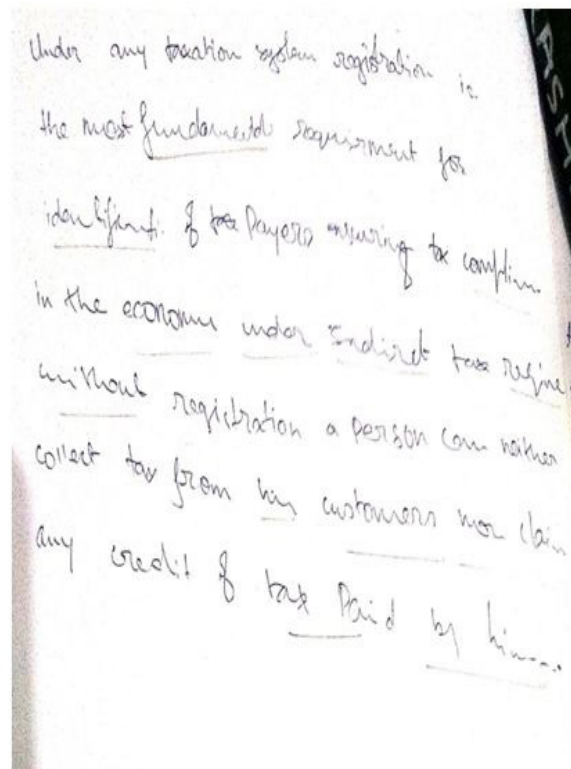
(b) Hesitation present (post)

Figure 10: Handwriting sample of the individual writer (a) Shows that the hesitation is absent before intoxication of the writer; (b) Shows that the hesitation is present because of the administration of the dosage of intoxication or alcohol of the writer. That corrupts the formation of the letter and causes clumsiness and deviation from straight line of the writing

Spacing



(a) Even word spacing (pre)



(b) Uneven word spacing (post)

Figure 11: Handwriting sample of the individual writer (a) Shows that the even spacing is present before intoxication of the writer; (b) shows uneven spacing because of the administration of the dosage of intoxication or alcohol of the writer

Discussion

These data suggest that alcoholic ingestion are indeed reflected in handwriting and can be predicted by selected handwriting characteristics and help in evaluating the authenticity of handwriting in judging whether the writer was sober or intoxicated and the level of effect they cause in handwriting features of penmanship. Similarly Simon also proposed a multiple classifier system method in domain of handwriting recognition system as based on slant and baseline [11]. The dosage of administration of alcohol level plays an important role at different alcoholic strength level nervousness and loss of muscular coordination leads to demarcation of wordsmith's natural variation of handwriting in intoxicated stage of writer. Study of the selected features based on the calculated data shows that there is an increase in size of the letter, hesitations; lack of smoothness, correction makes handwriting unrhymic and poor line quality appearance. Clumsiness of the handwriting due to lack of control in the execution of letters because of poor immovement of hands that leads to declination of legibility of writing Toxic ingestion induces changes in the central nervous system affect the writing mode and it corrupts the formation of letter. There would found some discerning features observed at different levels the metabolism of the individual is affected from lowest to highest alcohol level which conclude that handwriting is arranged mentally and performed neuromuscular which get affected during alcohol consumption that causes cognitive and physomotor effect. The increase in the quantity of alcohol leads to sharp increase in the features for getting deteriorated. There is an observable localization of tremors in the handwriting that is found at the increased range of toxications level there found an irregular deterioration and occasional restoration of the muscular coordination. There found a irregularity of line and haphazard change of curvature and lack of smoothness from stroke to stroke the number of lapses found in writing that give it spacing and increase in the size of the writer handwriting calligraphy which reflects a particular and oscillating individual pattern of the affected person.

Conclusion

The comparative study conducted of different blood alcohol concentration effect on handwriting was estimated in 100 subject and found that the alcohol consumption have significant effect on the general characteristics of handwriting. And dosage of the administration of alcohol plays important role as we have found that the increase level of toxic ingestion causes highest deterioration in the graphological features of the handwriting. All the Eleven features found to be significant or affected. Whereas the lowest blood alcohol concentration we have found that only six features to be affected which are as follows. Misspelling, Line quality, Spacing, Connecting strokes, Size, Pictorial effect, Leaving the features such as slant, Alignment, Tremors and Rhythm found to be unaffected or non-significant.

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