

**HANDWRITING CHARACTERISTICS VARIABILITY AMONG POPULATIONS
OF DAMAN AND DIU**

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ABSTRACT

Handwriting is a personal characteristics features that distinguish one person writing from that of another. Each person Handwriting is unique. Handwriting is a useful document that use in forensic cases. The Present study focused on the self-reported Handwriting in Daman and Diu. Data was collected by door to door survey with the help of pro-forma from age group 15-50 years in three different population group namely Patel, Muslim and Macchi. Handwriting variation found in all population groups, significant value found in word spacing, line spacing, letter spacing and capital word spacing, etc of handwriting script in population groups. These results are statistically inferable over the entire Daman population, the study validated the individuality hypothesis with 95-percent confidence. It has been observed that among Patel, Muslim, and Macchi. The handwriting is not good because these people are not interested in education. More studies should be carried out on Indian population so that the handwriting may be consider as important biometric variable and ethnicity can be inferred.

KEYWORDS: Education level, Handwriting variation, Patel, Muslim, and Macchi.

INTRODUCTION

Handwriting has continued to persist as a means of communication and recording information in day-to-day life even with the introduction of new technologies. Handwriting is a personal characteristic features that distinguish one person's writing from that of another. Each person Handwriting is unique. Handwriting is useful in criminal cases and also use in forensic investigation. Through Handwriting we also investigate and we can know about criminals. A person's handwriting is also relatively stable and changes little over time.(Morris 2000). There are many factors that influence Handwriting, likewise education level, mental tension, writing instrument, etc.

Academic study of a forensic handwriting examination

Class + Individual + (Idiosyncratic) = Academic
features feature features Identification

Idiosyncratic features in handwriting evolve from the individual features of an author, but they do not evolve to a significant degree in every person in the same manner. There for, idiosyncratic features in a writing are additions to the features of one's writing, and as such, they are significant in identifying individual writers.(Smith1944).

Every person whose handwriting is developed and permanently formed had adopted certain more or less distinctive peculiarities in the formation of letters of which he is generally unaware. There is no more certain thing than the fact that there have not yet been discovered two handwriting by separate persons so closely allied that a difference can't be detected by the trained observer.

- There are basic factors that influence handwriting. These are as follows
 - The level of education
 - Mechanical factors like writing instruments, the quality of the paper and the writing surface and the position of writing when writing.
 - Physical well-being like illness, injuries, medication, substances abuse, blindness and aging.
 - The emotional state of the writer.
 - The psychological factor, that is, the writer's physical make up and personality.
 - Lack of familiarity with the material being written.
 - In the present study an attempt has been made to study the handwriting patterns among different population groups namely Patel, Macchi, and Muslim of Daman and Diu with reference to gender, age and inter group variation.

Area and People

The Daman and Diu was a part of Goa that came under the rule of the Portuguese in the 16th century. The two districts remained a part of Goa and Goa acceded to the Union of India and Daman and Diu became the union territory. Daman district is one of the two districts of the union territory of Daman and Diu on the western coast of India, surrounded by Valsad District of Gujarat state on the north, east and south and the Arabian Sea to the west. Daman district is a union territory with administrative head quarter at Daman. The field work was conducted from Varkund village (Daman), Nani Daman (Daman), and Moti Daman (Daman). To study the Handwriting patterns among different population groups namely Patel, Macchi, and Muslim of Daman. The traditional occupation of the Macchi is fishing, which continues to be their primary source of livelihood and prepare a salt and salt purify. In

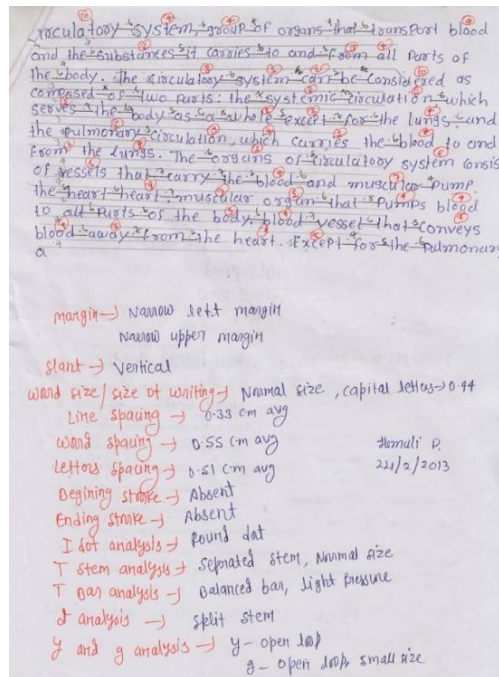
Macchi society their economic source is mostly fishing and some people are work in industries and factory. Ladies are also involved in working because they don't have agriculture field for farming. Macchi ladies generally wear sari and girls wear Salwarsuit, gents wear kurta pajama and lunge. Old people like to wear dhoti. Macchi houses are like hut type structure. Their roof made with the help of iron material and concrete. Patel is come in OBC category. Patel population is divided into many sub- population groups as like a mahyawansipatel, kamlipatel, kolipatel, dodhipatel, etc. They are divided on the basis of own property. In patels economic source is agriculture, business and work in company .The dress of men usually lunge, pajama, and shirt, mostly in white color. All males wear shoes which are made by leather and usually black in color .The dress of women consist blouse and sari. Girls wear suit, salwar and chunni. Muslims mostly are migrated from other place, Maximum Muslims are live in out of India as - UK, London, Dubai, Africa etc.

Material and Methods

The Present study focused on the self-reported Handwriting in Daman and Diu. Data was collected by door to door survey with the help of pro-forma from age group 15-50 years in three different population groups namely Patel, Muslim and Macchi. Total 230 samples of male and female between the age group 15-50 years were studies out of the total population , 106 males and 124 females were taken but the English script sample size is 98 out of the total population ,42 female and 56 male group.

Samples of the present database were collected by distributing pro-forma among Patel, Muslim, and Macchi population groups of Daman. Subjects were provided one page written in English and Gujarati. Subjects were requested to copy the standard text in their own Handwriting on the provided page. Subjects were asked to write the text with ball pen of any color. In case writing instrument was not available with the subject, it was supplied at random. No other restriction was imposed on the writer. After that they were asked to put their signature at the end of text.

Handwriting sample of English script



The following Handwriting characteristics were analyzed -

1. **Margin:-**A margin is the area between the main content of a page and the page edges . The margin helps to define where a line of text begin and ends .

1 inch margin: - Normal

1 inch< :-Wide

1 inch> :-Narrow

2. **Slant :-**slant is the angle of a letter in relation to the baseline . It is some time called slop. Slant refers to the angle of inclination of writing or a letter of writing from the base line of that writing.

- Vertical
- Moderate Left
- Moderate Right
- Extreme Left
- Extreme Right

3. **Word size/ size of handwriting: -**size of handwriting come a writing size of person as like a, Normal size, Small size, large size of handwriting script. In word size come measurements of length of big letters in average centimeter range.

4. **Line spacing: -** space between two lines of handwritings called line spacing. Line spacing generally consistent. Check the lines to see if any of the strokes intermingle

with strokes from other line. Take an average range of line spacing of handwriting of persons. Average line spacing has a .8 cm, they found in a notebook and books.

5. Word spacing:-word spacing is a space between words as being the width of the two letters. To take an average word spacing of handwriting.

6. Letter spacing:-Letter spacing is the amount of space put between letters. The letters could all be connected or spaced drastically, Letter spacing is a space between every letters of word in whole handwriting and take an average letters spacing of handwriting. e.g.-

the lazy
the lazy
the lazy

7. Beginning stroke: -Looks at how the writer begins their words. This option in beginning stroke -

➤ Present

➤ Absent

8. Ending stroke: - Looks at how the writer ends their words. This option in beginning stroke-

➤ Present

➤ Absent

9. 'i' dot analysis:- A portion of writing as small and as innocuous as an “i” dot may at times become a prominent identifying characteristic. “I” dots come in all sizes and shapes. They may be horseshoe shaped with the open end to the right, up, down or left, or be simply dots, circles, or dashes inclined up or down. This option in I dot analysis –

➤ Circular dot

➤ Round dot

➤ Oval dot

➤ Round & just alone the stem

➤ Round & left dot

➤ Round & right dot

➤ Absent

10. 't' stems analysis:- .

A "t" stem may go from right to left, left to right, it may incline up, incline down, or be perfectly horizontal. It may be heavily shaded on the right or heavily shaded on the left. The "t" may be crossed at the top of the letter, near the bottom, or in the middle. It may be connected to an exit stroke from a terminal letter of a word in a hasty attempt by the individual to cross the "t" without lifting the pen from the paper. Options of t stem analysis:-

- Separated
- Split stem
- Looped

't' Bar length analysis: - In bar analysis show analysis of bar length in height take a small alphabet ('t') of 'T'. His options are as following:-

- Balanced bar length
- Long bar length
- Small bar length
- Absent bar length

't' Bar pressure analysis:-In bar pressure analysis show the pressure of pen in write bar line on 't' alphabet . His options are as following:-

- Balanced pressure
- Light pressure
- Heavy pressure

'd' analysis :- In 'd' analysis show the variation of structure, size, and shape of 'd'. In analysis taken a small letter ('d') of 'D'. Every person has a different style of writing and every person write a same letter in different style, so found a variation in letters. His options of variations found in 'd' as following:-

- Without extension stem
- Looped stem
- Split stem
- Long stem
- Small stem

'y' and 'g' analysis:- In analysis show the variations in letter and small alphabet of his letter as like a 'y' and 'g' . Options are as following:-

- Open loop
- Close loop

- Absent

‘e’ analysis:-In ‘e’ analysis show the changes in loop structure, because many people write this letter in different types, maximum changes see in loop of letters. These options are as following:-

- Normal loop
- Narrow loop
- Close loop
- Wide loop

‘o’ and ‘a’ analysis:- In analysis show the changes in loop structure, both have a looped structure. These options are as following:-

- Close loop
- Open loop

‘m’ analysis:- In ‘m’ analysis show variation in structure, because found a many different types of structure. These options are as follow:-

- Round loop
- Sharp loop
- Uphill humps
- Downhill humps

‘l’ analysis:- In ‘l’ found a variation in structure and also found a looped structure. These options are as follow:-

- Stand stem
- Looped
- Split stem

Signature analysis:- In signature analysis show the many characteristics of signature ,because every individuals sign are different and his style are change , in every persons signature have a one different characters, as like a some people sign in running writing, short name in sign, surname in sign ,underline after signature and circle in signature etc or many characters are found . These options are:-

- Size of signature
 - Large size

- Medium
- Small
- Content
 - Full name
 - First name
 - Surname
- Legibility
 - Completely illegible
 - Surname is legible but first name is illegible
 - Surname is illegible but first name is legible
 - Completely legible
- Comparison of legibility with script
 - Script and signature both are clear
 - Script legible but signature illegible
 - Script illegible but signature legible
 - Both are illegible
- Placement
 - Right
 - Center
 - Left
- Slant
 - Vertical
 - Moderately left
 - Moderately right
 - Extreme left
 - Extreme right
- Embellishment
 - Line through signature
 - Underline

- Circles
- Full stop/ dot
- Vertical line at end
- Nothing

STATISTICAL VARIABLES:-

For analyzing data following basic statistic variables are used-

- 1 SPSS Software: - SPSS -16.0,2007software package was used in the present study.

Results:

Handwriting variation found in all population groups, significant value found in word spacing, line spacing, letter spacing and capital word spacing of handwriting script in population groups.

Table -1 Mean value of English script Handwriting

Variable Name	PATEL		MUSLIM		MACCHI		F value
	Mean± std.devi	S.Error	Mean±std.devi	S.Error	Mean±std.devi	S.Error	Total
Capita word size	0.42 ± 0.72	0.011	0.49 ± 0.11	0.020	0.44 ± 0.08	0.017	5.54
Letter spacing	0.56 ± 0.14	0.023	0.50 ± 0.19	0.034	0.50± 0.12	0.024	1.71
Ward spacing	0.62 ± 0.20	0.032	0.57± 0.18	0.031	.57± 0.13	0.026	1.03
Line spacing	0.36 ± 0.89	0.014	0.47 ± 0.15	0.026	0.37 ± 0.11	0.022	8.33

The mean difference is significant at the 0.05 level.

In Table-1 the data collected was analyzed statistically to find out the mean , standard deviation, standard error and F-test for English script of capital word size, word spacing, line spacing, and letters spacing of all population groups. Maximum mean value of capital word size is found in Muslim 0.49 than in Macchi 0.44 and in Patel 0.42. Maximum mean value of letter spacing found in a Patel 0.56 than in Muslim and Macchi is same value 0.50 . Maximum mean value of ward spacing found in Patel 0.62 than in Muslim and Macchi is also common 0.57. In line spacing maximum mean value found in a Muslim population group 0.47 than in Macchi 0.37 and in Patel 0.36 .

Table -2 POST HOC

Dependent Variable	(I) POPULATION	(J) POPULATION	Mean Difference (I-J)	Std. Error
LINESPACING	PATEL	MUSLIM	-.10987*	.02912
		MACCHI	-.00795	.03080
	MUSLIM	PATEL	.10987*	.02912
		MACCHI	.10192*	.03175
	MACCHI	KAMLI PATEL	.00795	.03080
		MUSLIM	-.10192*	.03175
CAPITALWDSIZ	PATEL	MUSLIM	-.07364*	.02267
		MACCHI	-.01839	.02398
	MUSLIM	PATEL	.07364*	.02267
		MACCHI	.05525*	.02472
	MACCHI	PATEL	.01839	.02398
		MUSLIM	-.05525*	.02472
WRDSPACING	PATEL	MUSLIM	.05186	.04258
		MACCHI	.05492	.04504
	MUSLIM	PATEL	-.05186	.04258
		MACCHI	.00306	.04644
	MACHI	PATEL	-.05492	.04504
		MUSLIM	-.00306	.04644
LETERSPCING	PATEL	MUSLIM	.06289	.03823
		MACCHI	.05993	.04044
	MUSLIM	PATEL	-.06289	.03823
		MACCHI	-.00296	.04169
	MACCHI	PATEL	-.05993	.04044
		MUSLIM	.00296	.04169

*. The mean difference is significant at the 0.05 level.

In Table- 2 see the mean differences of line spacing, capital word spacing, word spacing, and letter spacing, in all population group of English script. In line spacing mean difference is significant between Patel and Muslim, and also significant between Muslim and Macchi or between Patel and Macchi is non-significant. In capital word size mean difference is significant between Patel and Muslim, also in Muslim and Macchi is significant but mean difference is non-significant between Patel and Macchi. In word spacing and letter spacing all mean difference is non-significant between all population groups. Significant value is <0.05.

Table -3 CAPITAL WORD SIZE WITH POPULATION

In cm			POPULATION			TOTAL
			PATEL	MUSLIM	MACCHI	
CAPITALWDSIZ	.30 - .35	Count % within POPULATION	5 13.2%	3 9.1%	5 18.5%	13 13.3%
	.35 - .40	Count % within POPULATION	11 28.9%	4 12.1%	3 11.1%	18 18.4%
	.40 - .45	Count % within POPULATION	12 31.6%	7 21.2%	9 33.3%	28 28.6%
	.45 - .50	Count % within POPULATION	5 13.2%	7 21.2%	4 14.8%	16 16.3%
	.50 - .55	Count % within POPULATION	4 10.5%	4 12.1%	2 7.4%	10 10.2%
	.55 - .60	Count % within POPULATION	0 .0%	2 6.1%	2 7.4%	4 4.1%
	.60 - .65	Count % within POPULATION	0 .0%	3 9.1%	2 7.4%	5 5.1%
	.65 - .70	Count % within POPULATION	1 2.6%	1 3.0%	0 .0%	2 2.0%
	.75 - .80	Count % within POPULATION	0 .0%	2 6.1%	0 .0%	2 2.0%
TOTAL		Count % within POPULATION	38 100.0%	33 100.0%	27 100.0%	98 100.0%

Table-3 Present the capital word size with population in English script. Maximum percentage found in Macchi 33.3% of capital word size in range .40 - .45cm than in Patel 31.6% and in Muslim maximum percentage is common in two range 21.2% of capital word size in range. 40-.45cm, and .45-.50cm means in handwriting Macchi capital letter is larger than patel and Muslim.

Table-4 CAPITAL WORD SIZE WITH SEX

In cm			SEX		Total
			FEMALE	MALE	
CAPITALWDSIZ	.30-.35	Count	6	7	13
		% within SEX	14.3%	12.5%	13.3%
	.35-.40	Count	7	11	18
		% within SEX	16.7%	19.6%	18.4%
	.40-.45	Count	11	17	28
		% within SEX	26.2%	30.4%	28.6%
	.45-.50	Count	6	10	16
		% within SEX	14.3%	17.9%	16.3%
	.50-.55	Count	5	5	10
		% within SEX	11.9%	8.9%	10.2%
	.55-.60	Count	1	3	4
		% within SEX	2.4%	5.4%	4.1%
	.60-.65	Count	4	1	5
		% within SEX	9.5%	1.8%	5.1%
	.65-.70	Count	2	0	2
		% within SEX	4.8%	.0%	2.0%
	.75-.80	Count	0	2	2
		% within SEX	.0%	3.6%	2.0%
Total	Count	42	56	98	
		42.9%	57.1%	100.0%	
	% within SEX	100.0%	100.0%	100.0%	

Table - 4 of capital word size with sex among all population groups in English script. Maximum percentage found in male 30.4% of capital word size and in female maximum percentage is 26.2% of capital word size which ranges than. 40-.45cm, means in handwriting male's capital letter is larger than female in all population groups.
 RECAPITALWDSIZ :- Capital word size

Table -5 WORD SPACING WITH POPULATIONS

In cm			POPULATION				
			KAMLI PATEL	MUSLIM	MACCHI	TOTAL	
WORDSPACING	1	(.30-.45)	Count	3	9	5	17
			% within POPULATION	7.9%	27.3%	18.5%	17.3%
	2	(.45-.60)	Count	17	14	12	43
			% within POPULATION	44.7%	42.4%	44.4%	43.9%
	3	(.60-.75)	Count	14	4	8	26
			% within POPULATION	36.8%	12.1%	29.6%	26.5%
	4	(.75-.90)	Count	2	5	1	8
			% within POPULATION	5.3%	15.2%	3.7%	8.2%
	5	(.90-1.05)	Count	1	0	1	2
			% within POPULATION	2.6%	.0%	3.7%	2.0%
	7	(1.20-1.35)	Count	0	1	0	1
			% within POPULATION	.0%	3.0%	.0%	1.0%
	9	(1.35-1.50)	Count	1	0	0	1
			% within POPULATION	2.6%	.0%	.0%	1.0%
Total		Count	38	33	27	98	
		% within POPULATION	100.0%	100.0%	100.0%	100.0	

The Table-5 Present the crosstab table of word spacing with population in English script. Maximum percentage found in Patel 44.7% of word spacing in range .45-.60cm than in Macchi 44.4% and in Muslim maximum percentage is 42.4% of word spacing from range .45-.60cm, means in handwriting Patel and Macchi word spacing is larger than Muslim .

Table -6 word spacing with sex

In cm			SEX		Total
			FEMALE	MALE	
WORDSPACING	(.30-.45)	Count	7	10	17
		% within SEX	16.7%	17.9%	17.3%
	(.45-.60)	Count	18	25	43
		% within SEX	42.9%	44.6%	43.9%
	(.60-.75)	Count	12	14	26
		% within SEX	28.6%	25.0%	26.5%
	(.75-.90)	Count	4	4	8
		% within SEX	9.5%	7.1%	8.2%
	(.90-1.05)	Count	1	1	2
		% within SEX	2.4%	1.8%	2.0%
	(1.20-1.35)	Count	0	1	1
		% within SEX	.0%	1.8%	1.0%
	(1.50-1.65)	Count	0	1	1
		% within SEX	.0%	1.8%	1.0%
Total	Count	42	56	98	
	% within SEX	100.0%	100.0%	100.0%	

Table -6 present the word spacing with sex among all population group of English script . Maximum percentage found in male 44.6 % of word spacing and in female maximum percentage is 42.9 % of word spacing in range .45-.60 cm, means in handwriting males word spacing is larger than female in all population groups.

Table -7 Line spacing with population

	In cm	POPULATION			Total	
		PATEL	MUSLI M	MACCHI		
LINSPIACING	(.12-.22)	Count	2	1	4	7
		% within POPULATION	5.3%	3.0%	14.8%	7.1%
	(.22-.32)	Count	10	5	5	20
		% within POPULATION	26.3%	15.2%	18.5%	20.4%
	(.32-.42)	Count	17	7	8	32
		% within POPULATION	44.7%	21.2%	29.6%	32.7%
	(.42-.52)	Count	8	11	8	27
		% within POPULATION	21.1%	33.3%	29.6%	27.6%
	(.52-.62)	Count	1	4	2	7
		% within POPULATION	2.6%	12.1%	7.4%	7.1%
(.62-.72)	Count	0	2	0	2	
	% within POPULATION	.0%	6.1%	.0%	2.0%	
(.72-.82)	Count	0	2	0	2	
	% within POPULATION	.0%	6.1%	.0%	2.0%	
(.82-.92)	Count	0	1	0	1	
	% within POPULATION	.0%	3.0%	.0%	1.0%	
Total	Count	38	33	27	98	
	% within POPULATION	100.0%	100.0%	100.0%	100.0%	

Table-7 Present the frequency of line spacing among Patel, Muslim and Macchi in English script. In Patel a maximum percentage is found 44.7% in range .32-.42cm and in Macchi found a maximum percentage in two groups both are same 29.6% in range .32-.42cm and in .42-.52cm. In Muslim found a maximum percentage 33.3% in range .42-.52cm, means in all population group maximum percentage found in Patel population group of line spacing.

RELINSPACING:- LINE SPACING

Table -8 Line spacing with sex

In cm			SEX		Total
			FEMALE	MALE	
LINS PACING	(.12-.22)	Count	1	6	7
		% within SEX	2.4%	10.7%	7.1%
	(.22-.32)	Count	6	14	20
		% within SEX	14.3%	25.0%	20.4%
	(.32-.42)	Count	19	13	32
		% within SEX	45.2%	23.2%	32.7%
	(.42-.52)	Count	11	16	27
		% within SEX	26.2%	28.6%	27.6%
	(.52-.62)	Count	3	4	7
		% within SEX	7.1%	7.1%	7.1%
	(.62-.72)	Count	0	2	2
		% within SEX	.0%	3.6%	2.0%
	(.72-.82)	Count	2	0	2
		% within SEX	4.8%	.0%	2.0%
	(.82-.92)	Count	0	1	1
		% within SEX	.0%	1.8%	1.0%
	Total	Count	42	56	98
		% within SEX	100.0%	100.0%	100.0%

Table-8 Present the line spacing with sex among all population groups of English script. Maximum percentage found in female 45.2% of line spacing in range .32-.42cm and in male

maximum percentage is 28.6% of line spacing in range .42-.52cm, means in handwriting female line spacing is larger than male in all population group.

RELINSPACING:- LINE SPACING

DISCUSSION:

The percentage of females was higher than males because of their easy availability in the houses because maximum males were go on work. The present study indicates that Patel were more educated than Muslim and Macchi caste groups of Daman and Diu because 62.1% Patels were educated up to 11th standard while Muslims and Macchi were educated up to 10th standard with 20% and 30.4% respectively.

As far as occupation concerned all the three caste groups were involved in business, transportation, auto driving and factory working. Whereas females were occupied in factory work and as well as they were housewives. 17.2% females were housewives in Patel while 18.3% in Muslim and 16.1% in Macchi caste group. Students were prevalent among all the three caste groups. 69% Patel were students while in Muslim and Macchi they were 21.7% and 37.5%. The main reason for these more or less similar values among all three caste groups and in male and female is due to their schoolings in the local areas and due to their similar copybook pattern they are following. Lack of good English medium schools may be the reasons for the same and male and female both are not very educated.

So it has been observed that almost similar pattern of handwriting was found among Patel, Muslim and Macchi. Local level schooling and lack of higher education may be one of the reasons for the same. Saini and Kapoor (2014) studied identification of ethnicity (Brahmin, Panjabi, Jat, Baniya, Ahir, Bengali and Tmilian) based on handwriting patterns. They used 19 macro and micro handwriting features for the estimation of ethnicity these features include slant, spacing, stroke formations and lower cases alphabet.

It may be said that these results are statistically inferable over the entire Daman population, the study validated the individuality hypothesis with 95-percent confidence. It has been observed that among Patel, Muslim, and Macchi there is no good handwriting even they cannot write a correct words and sentences, means these people are not concentrate on study and are not interested in education. It is suggesting that more studies should be carried out on Indian population to consider the handwriting as important biometric variable. The general

characteristics of handwriting such as size, slant, spacing, margin, letter variations like 'i' dot analysis, 't' analysis, 'a' analysis, 'm' analysis, 'o' analysis, 'e' analysis, 'l' analysis, 'g' or 'y' analysis, and also take a some alphabet of Gujarati writing means some variation seen in Gujarati letters and signature analysis of handwriting. That conclusion have a come out among Patel, Muslim, and Macchi in all population group not found a good handwriting even they are not write exactly correct alphabet and sentence, means were people are not concentrate on study and not interested in education.

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