

# A STATISTICAL EVALUATION OF GENETICALLY INHERITED CHARACTERISTICS IN THE EXPANSION OF AN INDIVIDUAL HANDWRITING

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**Abstract:** The study entitled “statistical evaluation of genetically inherited characteristics in the expansion of individual handwriting” was carried out with the main aim to establish relationship between the similarities and differences in grandfather, father and grandson handwriting due to hereditary and adaptability. In this study, 100 samples of grandfather, father and grandson handwriting have been taken to conclude that the handwriting characteristics are genetically inherited by applying statistical measurements in their handwriting and adoption of few parameters (such as length, height and angle). Handwriting is a neuromuscular task and person's bone structure, hand- eye movement, learning and thinking ability are responsible for development of handwriting which are genetically inherited. The major problem faced in document examination is individualization that is handwriting of every individual is different. To overcome this problem, statistical tests can be used to determine the individuality of handwriting. In this study, statistical tests are incorporated in the handwriting samples by taking measurements of few words such as (variations, intricate and handwriting) and observations are drawn to conclude the similarities and differences in the handwriting of all the three generations i.e grandfather, father and grandson due to hereditary and adaptability.

**Keywords:** Genetically Inherited, Hereditary and Adaptability, Statistical Measurement, Individualization, Generations.

**Introduction:** Within the wide field of forensic science the scientific examination of handwriting has one purpose, to provide information about the identity of an individual for the benefit of a court of law. Parents are the children's learning models. THE DEVELOPMENT AND PROGRESS of one's handwriting passes through four stages in the course of a lifetime- The formative stage, the adolescent stage, the mature stage and the stage of degeneration. During adolescence stage, children try to copy their parents or grandparents' letters and words which are different from copy book standards. For eg.- if grandson likes his grandfather's way of forming few letters so he tries to inculcate in his own writing. When he is satisfied in copying the handwriting, he started writing without paying much attention to it as now its deeply rooted in his handwriting. By repeated attempts to copy this basic pattern the child incorporates the peculiarities of writing of his parents into his writing habits. The better his memory of forms and the more time he spends practicing letter forms written by his parents, the more habitual his movement becomes and the closer the new writing form will be to the parental writing model. By examining the handwriting characteristics of grandson, grandfather and father we can determine the similarity amongst them.

There is no specific gene responsible for inheritance of characteristics but person's bone structure, hand-eye movement are genetically inherited which plays crucial role in the development of handwriting of an individual. By evaluating the handwriting of grandfather, father and grandson can prove an advance step towards the inherited characteristics in the expansion of an individual handwriting.

This study will serve the purpose of court by establishing the fact that even if the suspect or culprit is not present at the time of providing samples of his handwriting for the comparison with the questioned handwriting, we can match the handwriting of his father or grandfather, as during adolescent stage the

suspect must have imitate their handwriting. Not exactly alike but few characteristics or few letters which are different from copy book standards or unique could be similar. Hence by using statistical data of genetically inherited characteristics in individual handwriting we can link the suspect even if he is not present or dead at the time of investigation.

**Methodology:** In this pilot study I have collected 100 samples including male and females from the population of Chandigarh, northern population of India. All the samples were collected on the basis of random sampling from 3 generations which include grandfather, father and grandson or granddaughter. Random sampling is done in order to ensure the equal participation of all the people and the consents were taken before collecting the samples. All the subjects were requested to write their own handwriting on the basis of the reference line i.e. “**variations are the intrical part of handwriting**”. All the samples were collected from 75 to 12 years age group. This sample collection is done during May and June 2017 at 40 to 42°C. The main of the study is to find out the similarities in the handwritings of the generations.

**Material:** During this study for the sampling purpose, all the samples were collected with the help of blue/black/green pen on white A 4 size sheet and preserved in the folder to avoid the damage to the paper. These samples are analyzed manually using different tools such as a hand magnifier and a stereo microscope, protector (to determine the angle), ruler and scales (to study the slant type of handwriting) stationary to check the degree of similarities in handwriting characteristics between father, grandfather and grandson. All the samples are photographed by using the camera of obi world phone. For statistical evaluation of the samples (mean, variance, standard deviation, error rate) SPSS software was used.

**Hypothesis:** In the present study, it was considered that the description of an individual can be constituted and a hypothesis was formulated. According to that

$H_0$  signifies that 3 generations handwriting will be genetically influenced and hence  $H_0$  will be accepted and  $H_1$  will be rejected.

$H_1$  signifies that 3 generations handwriting will not be genetically influenced and hence  $H_0$  will be rejected and  $H_1$  will be accepted.

#### Result and Discussion:

1)GRANDFA THER	LENGTH			HEIGHT			ANGLE		
	grandfa ther	fath er	Grand son	Grandfa ther	fath er	grand son	grandfa ther	fath er	Grand son
MEAN	10.7245	9.9	10.077	1.733	1.82	1.859	27.864	29.13	29.97
VARIANCE	3.7014	2.0274	3.8521	0.2382	0.1492	0.1360	24.912	19.8131	23.9741
STANDARD DEVIATION	1.9239	1.4239	1.9627	0.4880	0.3863	0.3688	4.9912	4.4512	4.8963
STANDARD ERROR	0.1934	0.1431	0.1972	0.0490	0.0388	0.0371	0.5016	0.4473	0.4921
95% Confidence Level (Grandfather and Grandson)	0.770028 and 0.878972			0.07466 and 0.09934.			1.13345 and 1.39855. <div>Calculate</div>		
95% confidence level (father and grandson)	0.1219 and 0.2181.			0.06641 and 0.08759			0.7089 and 0.9711.		

**Conclusion:** As per the statement mentioned in the methodology, measurements have been taken from all the handwriting samples of grandfather, father and grandson and three words (variations, intrical and handwriting) were selected in each type of handwriting samples and the parameters adopted are length, height, angle, standard deviation, mean, variance etc. Since it is known that human is not a machine who will work similar like machine so, variation was noticed up to a range of  $\pm 0.2\text{cm}$  in the measurement while the angle variation was noticed up to a level of  $1.5^\circ$ . Some of the variations may be

the presence of human error during examination or instruments variation. These parameters can be adopted for the examination of handwritten materials when the identity of suspect becomes a necessity and other examination fail to provide the clue. Such examination of substantial will prove their importance in getting to nab the suspect and can be put on the part of other exists techniques of examination in court of law.

The relationship between grandfather and grandson handwriting possess (0.07) 95% confidence level whereas father and son possess (0.06) 95% confidence level. Despite individual characteristics handwriting possess strong family likeness in their general characteristic features among the handwriting among same bloodlines or in other words it establishes a genotypic relationship in handwriting

The outcomes of this study are very satisfactory and encouraging that will be helpful in the examination of handwritten substantial even when the author is not present and facilitate with a new approach towards the examination. This study signifies that the handwriting of grandson shows similarities with the handwriting of grandfather and father with the variation of upto  $\pm 0.2\text{cm}$ . The investigators should be aware about the inadequacy of some type of evidences and shouldn't be inveigled by the circumstances of the case and render any subjective conclusion. There is numerous mechanism of document examination which allows the litigators to testify in court of law. These types of advancement can carry forward the examination of document for establishing the identity and can put on the par above of all evidences in court of law.

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