

J5 Pen Pressure Measurement in Signatures of Women and Men Using 3D Digital Microscopes

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Learning Overview: After attending this presentation, attendees will be informed about an idea regarding the contributions of measuring pen pressure numerically with microscopes, measuring surface roughness, and future research.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by indicating the usage of pen pressure measurement, which has an important place in the field of writing and signature examination, and by providing a study on an important subject such as measurement with 3D microscopes.

Frequently used diagnostic elements in signature examinations are pen pressure and pen pressure changes. Studies on pen pressure changes used to aid identification focus on online signatures placed on tablets.¹⁻⁴ However, the use of paper is still very common today.⁵ The purpose of this study is to numerically measure the pen pressure depth using 3D digital microscopes and to investigate whether there is a significant difference between the pen pressure depths of the handwriting of men and women.

Ten female and ten male graduates of university and high school were asked to sign their signatures three times on three different surfaces, using the same brand of pen and paper of the same type. In the first case, signatures were signed on an A4-sized file placed on a “file with clamps;” in the second case, a blank A4-sized paper of the same kind was placed under the paper on which the signatures were signed; and in the third case, two blank files of the same type were placed under the paper on which the signatures were signed.

Images were taken at 300X magnification using a Leica® DVM-6 brand microscope at the points determined on the signature samples and their 3D profiles were created for analysis. At the determined points, markings were made on the two opposite sides of the line by means of the LAS X software integrated into the microscope used, and the numerical values and graphs were obtained by measuring the depth of 540 points in micrometers (μm) at the distance between the two marker points. During the measurements, the maximum value given automatically by the software program was taken as the depth value at each point. In the study, it was investigated whether there is a difference between the depths of male and female subjects by using the independent sample *t*-test using the Statistical Package for the Social Sciences (SPSS) -25 software.

The values at each point of three signatures on three different surfaces were averaged for each person and, when it was investigated whether there was a significant difference between gender and signature depth using the independent sample *t*-test, it was found that there was no significant difference ($p > 0.05$).

In signature examination and comparisons, it is extremely important to determine the depth left by the pen tip on the paper. Since individuals habitually do not press the pen at the same level, the depth of the trace left by the pen tip varies from person to person. It is very important to measure the depth of the trace left by the pen numerically. The use of a 3D microscope is an innovation in this study, while investigating whether there is a difference between the depths of the signatures of women and men. In the literature search, no study was found on depth measurement using the same method. Although the pen pressure depth is expected to be deeper due to the stronger physical structure of men, no significant difference was found between the pen pressure depths of men's and women's handwriting in this study. One of the reasons for this may be the small sample size, but it may also be based on the principle that the amount of force applied while performing an action is proportional to the work done, although the physical structure of men is stronger than women.

Reference(s):

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