J9 An Interdisciplinary Study: Alcohol and Its Influence on Breath Alcohol Concentration (BrAC), Blood Alcohol Concentration (BAC), and Handwriting

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Learning Overview: After attending this presentation, attendees will better understand the influence that alcohol may have on a writer's handwriting signature.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by introducing a unique interdisciplinary case study in which handwriting was analyzed and the results compared to BrAC and BAC, as well as by teaching attendees about the effects alcohol has on the brain and nerves that may result in the writer's handwriting and signature containing characteristics of distortion.

Alcohol is a substance that is toxic to the human body, primarily the brain, and it directly influences human behavior. Ethanol can be found in alcoholic beverages. It is a modern poison that has an effect on the body's Central Nervous System (CNS) similar to that of anesthetics, such as ether or chloroform.

Previously published papers were primarily based on the analysis of the characteristics of handwriting and signatures of persons under the influence of alcohol with no significant statistical analyses. The goal of this research was to establish the significance of measuring the influence of alcohol in relation to blood, breath, and handwriting to carry out a statistical analysis of the collected data.

To verify the collected data, a controlled drinking study was conducted with 63 healthy volunteers (21 male and 42 female participants between the ages of 26 and 61 years) with a body mass index lower than 30. The participants consumed alcoholic beverages to simulate real drinking conditions.

Handwriting samples were taken before, immediately after, and an hour following alcohol consumption. They were examined under the VSC 6000 HS and Leica® stereo microscope.

The Dräger Breath Alcohol Analyser, model 6810Za, was used for breath analysis before and 15 minutes after alcohol consumption. Blood samples taken before and an hour after alcohol consumption were analyzed using the Perkin® Elmer® Gas Chromatograph with an ionization detector (Headspace/Gas Chromatograph/Flame Ionization Detector (HS/GC/FID-HS)) and TurboMatrix Headspace Auto Sampler.

The BrAC is the amount of alcohol in breath, while the BAC is the amount of alcohol in blood. No significant differences were found between the BrAC and BAC results obtained from a single participant. However, the same amount of the same alcoholic beverage shows different BACs in taller and heavier individuals as opposed to shorter and lighter individuals because the organism of taller and heavier persons contains more water, which dilutes the alcohol they consume.

Taking practice and theory into consideration, the changes visible in the handwriting of persons who are under the influence of alcohol are proportionate to BAC, but the effects of alcohol on handwriting may vary depending on the individual's health and their physical traits. Regarding the handwriting, the results obtained indicate that, in certain cases, handwriting characteristics, such as the size of the letters/words, length of syllables/words, space between letters/words, tremor, as well as others, significantly increase under the influence of alcohol. Handwriting was also compared to the results obtained by the Dräger test and blood sample analysis with the aim of establishing whether handwriting can be used for obtaining an accurate measurement of BAC of the person writing.

The results of this research may also be used in certain cases for establishing the effects of alcohol on a person's ability to drive, considering that the same part of the brain is responsible for writing and driving.

Handwriting, Breath Alcohol Concentration, Blood Alcohol Concentration