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ANDREA LEDIĆ *

Signature dating: A case study

Abstract

The most common question that a handwriting expert is confronted with is to determine whether or not the signature or handwriting in question is authentic or forged. Moreover, in many cases, the request is to determine if the date on the document is the actual date the document was created or if the document has been backdated.

Two methods of examination can be applied for the latter: the ink dating method as a destructive method or the signatures and handwriting dating method as a non-destructive method.

This case study aims to show the changes that occur in a person's signature over time.

During the secret investigation phase, the Croatian State Prosecutor's Office for the Suppression of Organized Crime and Corruption sent the Forensic Science Centre two Annexes to professional playing contracts containing two signatures in the name of Luka Modric. The experts were asked to determine if the questioned signatures were authentic and other facts relevant to the investigation (backdating etc.).

The results obtained have shown clear variations/developments in known signatures over time without applying any destructive method.

Keywords: *forensic science, forensic document examination, forensic signatures examination, backdating, non-destructive method.*

1. INTRODUCTION

In forensic handwriting and signature examination, the predominant aim of the expert is to determine whether or not a questioned signature (or handwriting) is authentic or forged.

Handwriting is a complex neuromuscular activity that involves continuous interaction between lower-level perceptual-motor and higher-level cognitive processes (Steviano et al.,

* Andrea Ledić, Forensic Science Centre Ivan Vučetić, MUP RH, Zagreb, Croatia.

2016). Everything starts with the cerebellum, a part of the brain below the occipital lobe and posterior to the brain stem responsible for motor activities (Pinel, 2017, Calgiuri and Mohammed, 2012).

Stievano et al. (2016) also hypothesised that neuropsychological performances and handwriting fluency would be mutually associated and that visuospatial generativity could have a specific role in handwriting speed.

In many cases, the expert is also asked to determine whether the date on the questioned document or the document is backdated.

As Kapoor et al. stated in 2021, document dating, which can include signatures or handwriting dating, is one of the most challenging areas in the field of questioned document examination and becomes of prime importance in cases involving the document having historical value, or the document in question bearing a date, that is disputed.

For this kind of examination, experts can use two methods: an Ink dating method or a Signature/handwriting dating process.

When the questioned document examiner (QDE) refers to the Ink Dating method, they are faced with a few questions:

1. How accurate is ink dating?
2. Is it possible to determine whether a document is artificially aged?
3. How can ink analysis of writing help determine when a document was produced?

To answer these questions, the QDE needs to know the constituents parts of the ink and how the ink behaves under certain circumstances.

The ink contains chemical dyes and solvents that degrade and evaporate and generally go through a drying process that can last up to two to four years (Sabater et al., 2021).

The most widely accepted chemical analysis technique, gas chromatography/mass spectrometry (GC/MS), can help us determine if a written entry was created in the past two or four years.

Researching ballpoint pen ink on paper is among the most challenging problems. On the one hand, once a document has been handwritten, the ink on paper starts the aging process and involves dye degradation and solvent evaporation. On the other hand, an expert has to use the previously mentioned destructive method (Sabbater et al., 2021).

There are occasions when QDE receive cases they are asked to place the production of signatures within an approximate time frame without using destructive methods.

QDE are aware that handwriting and signatures have a phase of maturation from childhood to adulthood and ageing from adult to old. Old age and illness, especially neurodegenerative diseases, may significantly affect and deteriorate the quality of handwriting and signatures of an individual (Engel-Yeger et al., 2012).

As Caligiuri and Mohammed (2012) stated, age-related motor changes manifest in various forms, including tremors and motor slowing, but the appearance and magnitude of these impairments can vary among individuals.

Many people, particularly those who often write well and freely, make slight but persistent changes in their handwriting, especially in signatures. An interval of five years or less under specific health or changed business conditions may show a number of permanent and significant changes (Caligiuri et al. 2014).

But the main problem the expert may face is getting an adequate number of contemporary standard samples, which allows placing questioned signatures in an approximate time frame to the date they were executed.

The present study, from casework, aims to show the changes that occur in a person's signature with time.

2. MATERIALS AND METHODS

During a covert investigation Croatian State Prosecutor's Office for the Suppression of Organized Crime and Corruption, which is a body of the Croatian criminal justice system, sent to Forensic Centre two Annexes to the professional playing contracts of Luka Modric, each containing a signature of Luka Modric which was in question (from 2004 and 2005) and 40 known Luka Modrić's signatures (from 2003-2014) for comparison.

The experts were asked to determine whether or not the questioned signatures on the Annexes to the professional playing contracts were authentic signatures of Luka Modrić and other facts relevant to the investigation (backdating etc.).

According to the ENFSI-ENFHEX[2] Best Practice manual, five main principles need to be considered when examining handwriting/signatures: "No two people write exactly alike; no one person writes exactly the same way twice; no two naturally written signatures are exactly the same; no one is able to imitate all of the features of another person's handwriting and simultaneously write at the same relative speed and skill as the writer that he/she is seeking to imitate and in those cases where the writer disguises their normal handwriting or imitates the handwriting of another person, it is not always possible to identify the author of the handwriting".

Also, the minimum instrumentation required to undertake a handwriting examination is a microscope and a suitable light source with enough intensity of light to allow the examination of the fine detail of the handwriting[1].

Features to be noted for both handwritten entries and signatures (both "questioned" and "known") include general characteristics (style, size, proportion, spacing, slope, fluency/ pressure, tracing, layout etc.) and specific characteristics (individual character shape, individual character proportions, individual character construction, individual parts of the signature, relative fluency and pen pressure etc.).

After analysing general and specific handwriting characteristics (applies to both "questioned "and "known "), comparison and evaluation of findings are applied.

[2] ENFSI, ENFHEX- BEST PRACTICE MANUAL

In the first phase of the examination, the two questioned signatures were analysed under the VSC 6000 HS and stereomicroscope to determine the manufacturing process and to detect all general and specific handwriting characteristics of the two questioned signatures.

In the second phase, all known signatures were analysed to detect all general and specific handwriting characteristics.

The final phase of the analysis included the comparison of two questioned signatures with all known signatures.

3. RESULTS

Two questioned signatures were analysed under the VSC 6000 HS and stereomicroscope, and it was found that one signature was signed with ceramic black pen ink while another was signed with blue ballpoint pen ink.

After that, by comparing the two Luka Modric's questioned signatures, similarities in all general and specific characteristics were detected. It can be concluded that the writer is the same (one) person (*Fig.1*).

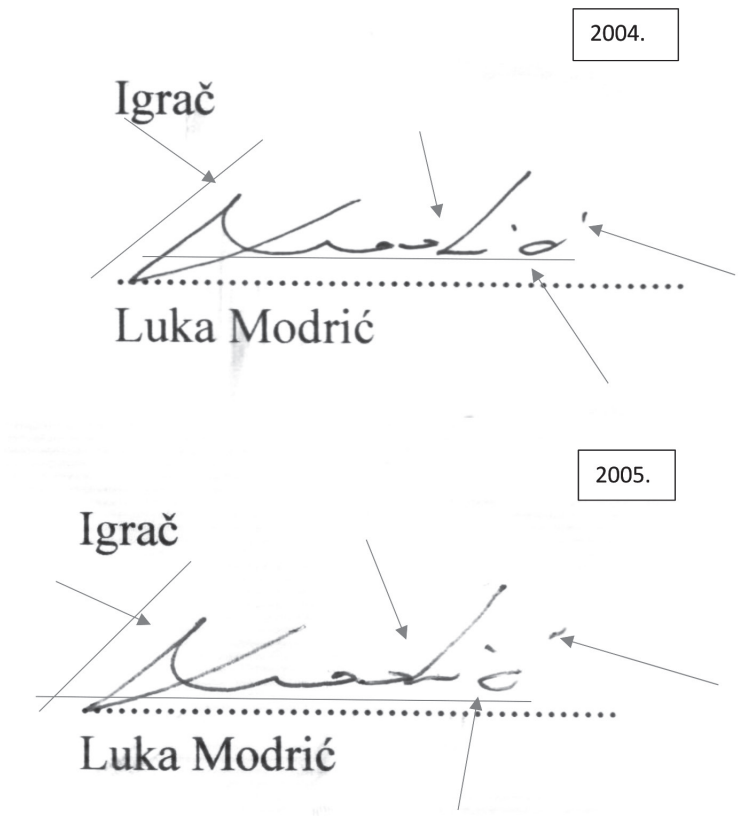

Figure 1. Comparing two questioned signatures

Analysis of all known Luka Modric's signatures indicated that his signatures had passed the maturation phase from teenagerhood to adulthood (*Fig. 2*).

The experts have to stress that in 2003 Luka Modric was 18 years old, and his signatures were very similar to the Croatian copybook signature model. His signatures changed over the years and according to the maturation process. His signatures changed from legible to illegible form.

The most significant change is visible around 2007 onwards (*Fig.2.*).

Figure 2. Known signatures from 2003-2012

The last analysis phase included comparing two questioned Luka Modric' s signatures with all known signatures (*Fig. 3*).

By comparing the questioned signatures with all of Luka Modric's known signatures (dated from 2003 to 2014), similarities in all general and specific characteristics with known signatures dated from 2008 to 2014 were detected, while in relation to the known signatures dated from 2003 to 2007, some differences were detected that can be interpreted as a maturation process in Luka Modrić's handwriting (*Fig. 3*).

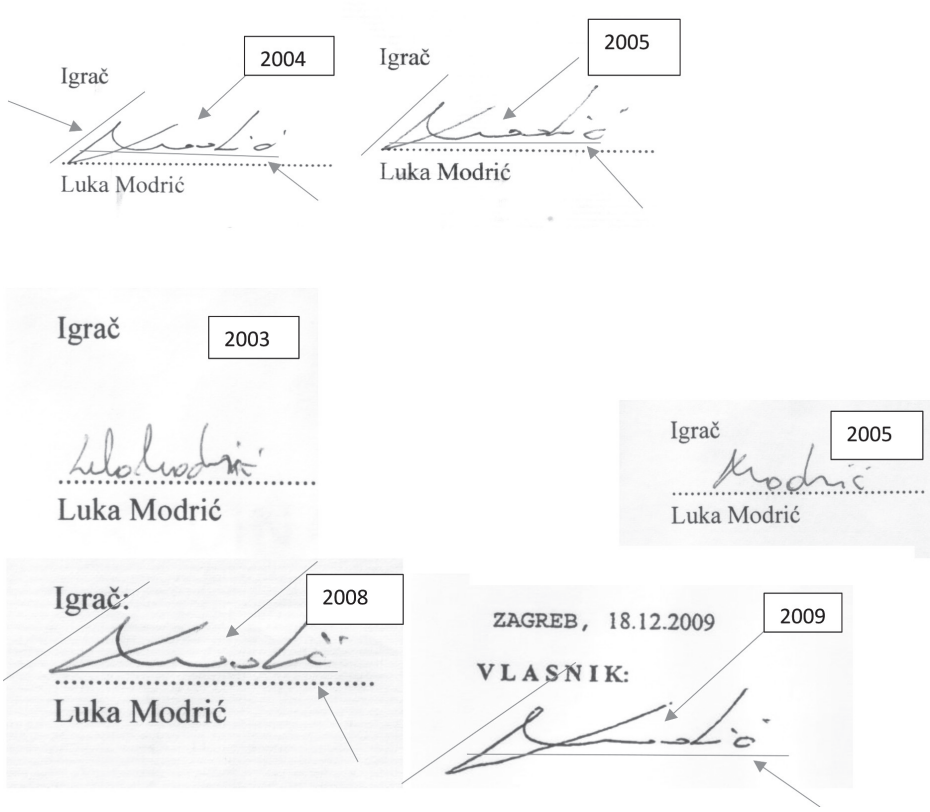

Figure 3. Questioned signatures from 2004 and 2005 (up) and known signatures from 2003, 2005, 2008 and 2009 (down)

4. CONCLUSION

The examination shows an evident variation in the signature over time. All variations are the natural variations of the same (one) writer.

It is undisputed that the questioned signatures are authentic Luka Modric's signatures, but the findings indicate that the dates on Annexes contracts were backdated.

The County Court and the Supreme Court accepted the forensic report and acquitted the suspect.

5. DISCUSSION

This study aimed to examine age-related changes in signatures in a young, healthy writer. Our findings indicated that within the range of 5 years of age, there were many differences in general and specific handwriting characteristics during natural signature writing.

In a previous study on signature writing kinematics in healthy aging, Caligiuri et.al. (2014) studied age-related changes in signature kinematics in forty-two healthy writers (24 male and 18 female) aged 60-91 years. Results suggest that the effects of age on handwriting late in life occur progressively (the handwriting kinematics for 60–69-year-olds did not differ from kinematics for 70–79-year-olds, writers over the age of 79 exhibited lower stroke velocities and pen pressure than their younger counterparts). Still, at a young age, there are many differences in handwriting.

Also, according to the available literature, the most significant changes in handwriting occur in children between 5-9 years of age and after 18 (Arnold et al., 1983).

In summary, the present case study is to examine the effects of age on signatures. Perhaps one of the more challenging tasks confronting QDE is determining the authorship of signatures written by an individual late in life and then backdated. Therefore, such cases are very useful for QDE.

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Sažetak

Andrea Ledić

Utvrđivanje starosti potpisa: primjer iz prakse

Najčešće pitanje s kojim se u svojem svakodnevnom radu susreću vještaci za rukopise jest mogu li utvrditi je li sporni potpis ili rukopis autentičan ili krivotvoren. Štoviše, u mnogim slučajevima moraju i utvrditi je li datum na dokumentu stvarni datum kada je dokument izrađen ili je dokument antedatiran. Za ovu vrstu ispitivanja mogu se primijeniti dvije metode: metoda utvrđivanja starosti tinte kao destruktivna te metoda utvrđivanja starosti potpisa i rukopisa kao nedestruktivna metoda.
Cilj ovog primjera iz prakse jest pokazati promjene koje se događaju u potpisu osobe tijekom vremena. Ured za suzbijanje korupcije i organiziranog kriminaliteta u fazi tajne istrage dostavio je na vještačenja Centru za forenzična ispitivanja, istraživanja i vještačenja „Ivan Vučetić" dva aneksa ugovora o profesionalnom igranju s dva sporna potpisa Luke Modrića.
Zadatak vještačenja bilo je utvrditi jesu li sporni autentični potpisi te ostale činjenice koje mogu biti bitne za samu istragu (jesu li potpisi možda antedatirani i sl.).
Dobiveni rezultati pokazali su vidljive varijacije/razvoj u nespornim potpisima tijekom vremena, i to bez primjene bilo kakve destruktivne metode.

Ključne riječi: forenzična znanost, forenzična ispitivanja dokumenata, forenzična ispitivanja potpisa, antedatiranje, nedestruktivne metode.