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THE ISSUE OF SIMILAR HANDWRITINGS WITH A PARTICULAR FOCUS ON THE DETERMINANTS AFFECTING THE QUALITY OF PRODUCING A HANDWRITTEN RECORD

Abstract: There are cases in the opinion-making practice where manuscripts produced by different persons demonstrate far-reaching similarities of graphisms. This may lead to a manifest error by an expert. Omitting the phenomenon of graphism similarity, which stems from the repetitiveness of analogous structural solutions in handwriting produced by different writers, may result in judicial errors. The objective of this paper is to present the problem of manuscripts showing far-reaching convergences regarding the handwriting features.

Keywords: handwriting expert opinion, similar handwritings, quality of record, author of manuscript, identification

Forensics has developed and offers numerous methods for personal identification using the so-called traditional research methods; moreover, it adapts and enriches modern research systems,[1] as well as adjusts the existing methods to them.[2] At the same time, it seeks to indicate the commonly accepted criteria for the separation and evaluation of identification features, which will enable correct and unambiguous conclusions to be drawn. Handwriting studies are a classic example of identification expert opinions aimed at determining the author of a manuscript or a signature which has undergone an analysis as a controversial one. The analysis should be based on objectified data that would allow for achieving reproducible results under identical research conditions.[3]

[1] M. Goc, *Współczesny model ekspertyzy pismoznawczej. Wykorzystanie nowych metod i technik badawczych*, Warszawa-Szczecin 2016.

[2] E.g. statistical methods or probability theory.

[3] T. Tomaszewski, "Ku przestrodze biegłych: Przypadkowe podobieństwo grafizmów", *Człowiek i Dokumenty* 2015, no. 39, p. 51.

The modern handwriting identification is based on several assumptions which have been proven correct both in opinion-making practice and in the results of experimental research:

1. The writing habit is individual in nature.
2. The writing habit is relatively stable.
3. Personal graphism has a syndromatic character.[4]

Handwriting is a personally individualised psychophysical trace of a person, due to which — during the writing process — each person leaves individual features on paper, relating to his/her physical and psychophysical habits allowing for the identification of the writer. As an individual organism, a person needs to learn how to write and then improve this skill.[5] It means that the writer must have an auditory image in order to capture a letter and a word as a whole, and imagine the route of drawing particular graphic signs.[6] It is a mental process which arises from a combination of various factors occurring during writing and reading either simultaneously or consecutively, whereas the physiology of the writing process consists in the activation of extremely complicated neural connections, their integration in the cerebral cortex, and coordinated transmission of impulses to the motor apparatus of the hand. A person with a well-developed writing habit, efficiently using the handwriting technique, can effortlessly produce certain movements following a particular impulse, while children learning how to write need numerous impulses in the cerebral cortex which connect with the eyesight control system, adding kinesthetic[7] impressions. Since the writing activity is more complex in its physiology and psychology than other mental functions, it appears quite late. During the learning process, graphic symbols are first assimilated and then associated with audio signs. In the first phase, writing is a mental activity which only later becomes a motor one. This process is very vivid in the first phase of learning how to write, when a child imitates particular letters from the primer, heavily focusing on the image of the sign.[8] Therefore, it can be clearly stated that individuality is a result of the reflex personalization process, consisting in a gradual departure from faithful imitation of the graphic pattern recommended by the school curriculum. As a result, the graphic product of a given person is different from the graphic products of other people.[9]

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[4] T. Widła, "Przypadkowe podobieństwa grafizmów", [in:] *Problematyka dowodu z ekspertyzy dokumentów*, vol. 1, ed. Z. Kegel, Wrocław 2002, p. 383.

[5] A. Klęsk, *Psychofizjoloia i patologia pisma*, Lwów 1924, p. 10.

[6] T. Wróbel, *Pismo i pisanie w nauczaniu początkowym*, Warszawa 1985, pp. 47–48.

[7] T. Luśnia, "Kształtowanie się cech osobniczych pisma ręcznego podczas procesu nauczania u dzieci w wieku wczesnoszkolnym", [in:] *Badanie dokumentów. Kształtowanie się cech osobniczych pisma ręcznego*, Warszawa 1999, p. 37 ff.

[8] A. Feluś, *Odchylenia materialne w piśmie osobniczym z pogranicza grafologii i ekspertyzy pismoznawczej*, Katowice 1979, pp. 45–46.

[9] Antoni Feluś calls this phenomenon the process of handwriting personalization/individualization. Each person achieves this desired handwriting level, although this moment is individualized and depends on the psychophysical predispositions of a particular person. Idem, op. cit., 46 ff.

Handwriting as an effect of the complex writing process reflects the individual construction of a person. The handwriting of each person constitutes the one and only harmonious whole impossible to repeat. However, the handwriting features are not always permanent and invariable.[10] Throughout our lives, we are influenced by various factors of internal or external origin. We write in different circumstances and conditions, under the impact of different emotional states. There are factors which cause significant changes in graphism and those that do not have a major influence on the transformation of handwriting. It is worth pointing out those factors which may cause the occurrence or disappearance of the features characteristic for graphism. The factors affecting the change of graphism in relation to the previously shaped individual pattern which characterises a person's handwriting undergo various classifications. In literature,[11] there is quite a common classification into:

— endogenous (internal) factors emerging from the state of the human psychophysical system. They can comprise: injuries and limb contusions, mental illnesses, drug and alcohol intoxication, the effects of pharmaceuticals and poisons, psychological shocks, illnesses reducing psychomotor capability;

— exogenous (external) factors resulting from the circumstances of the writing act itself. They can comprise: the ambient temperature, the type of writing agent, the substrate on which the record is written,[12] the use of a prosthesis, the use of another person's help while writing, the so-called guided handwriting.[13]

The above factors[14] may be classified as:

— physiological, related to the periods of human development,

— disease-related, including mental illnesses and disorders, general illnesses, neurological diseases,

— medicine poisoning and the effects of the medicaments taken, narcotic drugs, alcohol,

— mental and physical stress.

[10] According to Zbigniew Czeczot, we achieve the handwriting stability, called the desired handwriting level, before 30 years of age. Idem, *Badania identyfikacyjne pisma ręcznego*, Warszawa 1971, pp. 19–20.

[11] E. Pięciorek, "Deformacje pisma ręcznego, a zwłaszcza wpływ ciężkiej pracy fizycznej na jego obraz", [in:] *Deformacje pisma ręcznego*, Warszawa 1999, pp. 12–13.

[12] For more see I. Zieniewicz, S. Skubisz-Ślusarczyk, "Rodzaj podłoża a zmiany w grafizmie", [in:] *Zagadnienia dowodu z ekspertyzy dokumentów*, ed. R. Cieśla, Wrocław 2017, p. 501 ff.

[13] For more see I. Zieniewicz, S. Skubisz-Ślusarczyk, "Świadomość przy sporządzaniu testamentu i pomoc udzielana testatorowi a ważność testamentu", paper presented at *Congresso di Grafologia Giudiziaria*, Naples 2011. See also T. Tomaszewski, "O niedobrych opiniach, kontradyktoryjnej ekspertyzie i 'ręce prowadzonej'", *Człowiek i Dokumenty* 2018, no. 48, pp. 49–59.

[14] In literature, the said features undergo different classifications. For more see A. Klęsk, op. cit., p. 29 ff.; Z. Czeczot, op. cit., p. 27 ff.; A. Feluś, op. cit., p. 49 ff.; J. Pobocha, "Problemy patologii pisma", *Z Zagadnień Kryminalistyki* 1988, no. 20, p. 117 ff.; Z Kegel, *Dowód z ekspertyzy pismoznawczej w polskiej procedurze karnej*, Wrocław 1973, p. 44 ff.; E. Napieralska-Ozga, "Wybrane zagadnienia wpływu zmian ustroju psychofizycznego człowieka oraz innych czynników na wygląd pisma ręcznego, a w szczególności podpisów", [in:] *Problematyka dowodu z ekspertyzy dokumentów*, p. 103.

The presented classification puts emphasis on the influence of specific factors on handwriting, and on the permanence or temporariness of changes. Internal factors may cause permanent or temporary changes while external factors are, in principle, temporary. Therefore, when talking about a relative stability of the writing habit, the following assumptions should be taken into account:

— no one can ever produce identical graphism numerous times (unless we mean copying),

— under natural conditions, fluctuations close within cognisable, individually differentiated boundaries.[15]

Assuming a relative stability of handwriting, it is necessary to consider a situation when there are no graphic solutions unique to an individual, whereas certain configurations, groups that form a set of traces[16] are individually significant. Among the population of writers, some graphic solutions or even their groups repeat with different frequency. Taking it into account, one can try to determine the identification value of particular groups of handwriting features. According to Tadeusz Widła, this *status quo* has its positive and negative aspects. The advantages are expressed in the possibility of drawing positive identification conclusions, even if the graphisms under analysis are characterised by external distinctness.[17] The disadvantages unfortunately include a risk of error higher than in the case of other expert opinions, which may be caused by poor knowledge of how frequently particular features occur in the population, a variability of these features, and the phenomenon of accidental similarities between individual graphisms.[18] Can we really speak of such far-reaching similarities implying identicalness? With regard to handwriting, can we say that we are dealing with so-called doubles? It is worth referring to this issue not only because in the opinion-making practice, there are cases of convergent features in graphisms, but also in order to investigate this extremely important and somewhat mysterious phenomenon, which is the object of experimental research aimed at establishing certain regularities in the occurrence of similarities within the analysed group of people, as will be discussed further. What is also extremely valuable are considerations based on case studies which provide practical material and confirm the existence of this problem in experts' practice. Both the practice analyses and observations characterizing this phenomenon draw attention to the types of similarities occurring in the graphisms of different people, and — most importantly — indicate how to avoid an error as well as the fact that it is not always possible to avoid mistakes in opinion-making.[19]

The discussion of the problem of similar handwritings should begin with general findings, i.e., explanation of the notion of similarity. According to the dictio-

[15] Research conducted by Tadeusz Widła; idem, op. cit., p. 383; M. Goc, op. cit., p. 130.

[16] It is not a constant image such as in fingerprint expert opinions.

[17] Distinctness must be confirmed in research material.

[18] T. Widła, op. cit., p. 384.

[19] Ibid., p. 388.

nary of the Polish language, *similarity* is "the commonality of certain features of two or more people, objects, etc.," and the adjective *similar* derived from it means "having certain features in common with something, with someone."[20] Thus, with regard to its comprehension, the term itself does not give rise to any doubts. What can be difficult about it is an attempt to measure this phenomenon, i.e., to define these features as well as identify the reasons for similarities. In principle, in each field of science or knowledge, the tool for identifying similarities of the studied objects is the measurement method,[21] which also provides a basis for drawing conclusions of cognitive significance. Unfortunately, the evaluation of similarity may be objective, but may also take on a subjective dimension based on the knowledge or even the experience of the researcher. The above situation may relate to handwriting analyses which do not directly evaluate the detailed values of the features entitling one to draw conclusions on the basis of analyzing similar/analogous features, which is possible, e.g., in fingerprint analyses conducted on the basis of the quantitative or quantitative-qualitative methods.[22]

The issue of similarities present in handwritten records of different persons may be considered with regard to:

— the reasons for similarities present in handwritten records,

— a possibility to specify the quality of features or groups of features they refer to (general similarity, similarity going beyond the general form),

— including this phenomenon in expert opinion-making and developing a course of action.

There are several determinants specifying the quality and type of similarities between graphisms, and they virtually define the category for the classification and analysis of a graphism. Based on the review of scientific publications in the field of handwriting analysis, similarities in handwriting can be divided into three types:

1. Environmental similarities, which may include for example:
— family similarities,
— professional similarities,
— school similarities,
— similarities among schoolmates,
— gender-related similarities.
2. Accidental similarities.
3. Accidental similarities in the form of record doubles.
4. Crime-based similarities (copying and imitation).

[20] https://sjp.pwn.pl/sjp/podobienstwo;2502479.html (accessed: 23.10.2018); https://sjp.pwn.pl/sjp/podobny;2502489.html (accessed: 23.10.2018).

[21] Fingerprint features evaluation. In handwriting research, the reasoning method through analogy is applied, which consists in deduction based on a certain feature possessed by a given object on the basis of its similarity to another object which has that feature. M. Goc, op. cit., pp. 164–175.

[22] J. Moszczyński, *Subiektywizm w badaniach identyfikacyjnych. Przyczyny i zakres stosowania subiektywnych ocen w wybranych metodach identyfikacji człowieka*, Olsztyn 2011, pp. 58–80.

The first group of similarities present in graphic records are the so-called environmental similarities. Due to their diverse nature, they require a more detailed classification. It is possible to take into account different criteria, including: the fact of being born into and growing in a particular family, school education, group of friends, working in a similar environment.

Family similarities present in the handwritten records of family members constitute a considerable problem in the opinion-making practice, for example in cases aimed at identifying the executor of a testament produced in poorly developed handwriting, sometimes additionally deformed.[23] Based on the analysis of expert practice (case studies), one can distinguish the so-called similarities in the handwritings of family members in different relationship patterns: vertical (e.g. mother–daughter), horizontal (e.g. brother–brother, also stepbrother), affinity-related (e.g. husband–wife), mixed (e.g. similarity of the graphism of a woman to the handwriting of her subsequent husband and her daughter from another relationship).[24] According to Tadeusz Widła, the discussed family graphism similarities should be considered as environmental similarities, and the notion of *family* should only be treated as an environment. It is difficult to talk about genetic determinants here, since it is impossible to prove in a "methodologically impeccable" manner that genetic relationships between graphisms exist.[25]

According to the publications, scientists are particularly interested in the issue of similarities between the handwritings of twins, which is caused by reports directly from the opinion-forming practice proving that such records are sometimes so similar that it is difficult to differentiate them. For example, research on this issue undertaken by Christiane Uhlig concerned the handwriting produced by mono- and dizygotic twins and by a control group. The author accepted a hypothesis that both the genetic origin and the influence of "relatively identical or special environmental impacts" increase the probability of the occurrence of similar handwriting in twins. He evaluated the general optical similarity of handwriting, then the general features of handwriting which were not listed in detail by the author in his publication, and finally — the features related to the selected elements of the letter structures and the connections between the elements of graphic signs — including the structure of special handwriting features.[26] According to the research description, the persons participating in the first stage were laypersons, whereas the other stages were conducted by persons demonstrating knowledge in the field of handwriting studies. The results obtained from the comparison of graphisms confirmed the previously accepted hypothesis that the highest compatibility of features considered at all stages of analysis was among the pairs of monozygotic

[23] T. Widła, op. cit., p. 385.

[24] Ibid., p. 454.

[25] Ibid.

[26] The author did not enumerate the features in his publication. Ch. Uhlig, "Podobieństwa pisma u bliźniąt jedno- i dwujajowych", [in:] *Problematyka dowodu z ekspertyzy dokumentów*, pp. 331–332.

twins, as compared to the dizygotic twins and the persons in the control group. Among dizygotic twins, the similarity index of handwriting features was much lower and quite close to the control group. The results of the analysis showed a genetic and environmental influence on the presence of similarities in graphism.

The similarities between the handwritings of monozygotic and dizygotic twins were also the subject of research conducted by Czesław Grzeszyk and Eugeniusz Grzechnik, which was based on an assumption concerning the heredity of morphological, physiological, biochemical, and psychological features of a person. However, it also took into account the environmental conditions in which they live.[27] At the same time, in their paper, the authors referred to the results of scientific research on twins which indicate the heredity of morphological features including talents, physical development, motor development, or intelligence. Those results as well as the similarity of appearance, silhouette, behavior, and the voice of twins may entitle one to also formulate a hypothesis about the genetic conditions of similarities present in their handwritings.[28] The authors used a research method called the handwriting gramm density.[29] During the research, handwriting of the same person, followed by the monozygotic twins, dizygotic twins, and a control group, was analyzed. On their basis, a conclusion was drawn that there is a partial genetic condition of similarities in the handwritten records produced by monozygotic twins, as indicated by the fact that smallest differences in the values of coefficients of the tested parameter were found in the handwriting of the same persons. Greater differences of the value of the handwriting density coefficient were found in the records of dizygotic twins and the control group.[30]

As clearly shown in the aforementioned studies, although similarities in writing are genetically determined, it is impossible to consider them in isolation from environmental impacts which were demonstrated by the authors of the conducted analyses. However, the research did not determine to what extent similarity of records is influenced by genetics and affected by the environment in which a given person grows up and functions.

The similarities occurring in the records of various persons can also have a school origin resulting from the assimilation of a specific calligraphic model. They are particularly noticeable at the initial stages of education, as children write in special three-line notebooks and focus their efforts on accurately imitating the graphic signs they have learnt. Obviously, due to the lack of sufficient signs of individuality, such records are not suitable for handwriting analyses, yet what is worth noting are the instances of handwritings that remain underdeveloped and are

[27] C. Grzeszyk, E. Grzechnik, "Badanie pisma ręcznego bliźniąt", [in:] *Problematyka dowodu z ekspertyzy dokumentów*, p. 196.

[28] Ibid., p. 197.

[29] G = Ig/L (g/cm), where Ig — the number of gramms in the handwriting of the measured text, L — total length of words, letters making up the text. C. Grzeszyk, E. Grzechnik, op. cit., p. 197.

[30] Ibid., pp. 199–200.

similar to a school handwriting. In such cases, similarity to the calligraphic model may considerably impede an analysis.

Analogies may also occur in the handwritings of two or more people who maintain friendly contacts with each other, and — while this may apply to people of different ages — it particularly concerns the younger part of the society whose behavior is obviously under a strong influence of the environment. Compatibilities may appear in the form of analogous solutions for handwriting features, whether transitional or fixed, and they may be similarities used deliberately or unconsciously.

The common handwriting features may also emerge from the pursued profession. Doctors and accountants can serve as an example of two extremely different professions whose handwriting is frequently identified and called with an adequate name. With regard to the former group, illegibility is considered to be a standard of a kind due to the extreme simplification of the writing, which may result in a similarity of its image. In the case of the latter profession, which requires accuracy, not to say scrupulousness of records, there are similarities in the form of legible and neat records which resemble one another at least in terms of the general image, and sometimes also of more detailed features.

Gender is another reason for the possibility of similar handwritings. Certainly, the analogies present here do not interfere with the identification process and at the same time they can be used for group conclusions regarding the author of a record. The features common for women's and men's handwritings were selected on the basis of research carried out by Tadeusz Widła.[31] According to the results, it is possible to determine the gender on the basis of handwritten records. In the author's opinion, women's handwriting is characterized by: concavity of the left margin, right-hand deflection of the right margin, shortening of majuscules, small spaces between the lines, a loopy modelling of the letter "l," an arcade-shaped initiation of the letter "m," a loopy modelling of the letter "j," an arcade-shaped initiation of the letter "y," an arcade-shaped initiation of the letter "u," anticlockwise finishing of the oval in the letter "a," an arcade-shaped modelling of the letter "m," an arcade-shaped modelling of the letter "n," and an average length of upper zone elements. On the contrary, men's handwriting features are: average spaces between the lines, excessive length of upper zone elements, average length of majuscules, excessive length of majuscules, cane-shaped modelling of the letter "l," cane-shaped modelling of the letter "j," acute-angled initiation of the letters "y" and "u," a threadlike shape of the letters "n" and "w," clockwise finishing of the oval in the letter "a."[32]

[31] The author distinguished 28 women's features and 32 men's features. T. Widła, "Cechy płci w piśmie ręcznym", *Prace Naukowe Uniwersytetu Śląskiego w Katowicach* 1986, no. 811.

[32] The author also conducted an analysis regarding identification of gender features among young people. T. Widła, "Cechy płci w rękopisach młodzieży", [in:], *Problematyka dowodu z ekspertyzy dokumentów*, pp. 131–132.

These observations can be used to distinguish between manuscripts produced by women and men, where one can take into account observations on the predominance of one's own gender characteristics over those of the so-called foreign gender. Nevertheless, it should be borne in mind that this gender reference is not always unambiguous because, as studies show, an average manuscript of a male proband contains as many male as female features, while that of a female proband contains more of the features[33] assigned to her own gender.[34] Therefore, it cannot be ruled out that similar male and female handwritings may occur, as can be seen in the handwritings of twins.

Another category is the accidental similarities of handwritten records coming from various unrelated persons. Although they can obviously demonstrate various levels, they can sometimes impede the research and — in consequence — a record will not be assigned to its actual author.[35]

In extreme cases, the similarity of records may be an exact one, yet accidental and not caused by, e.g., kinship. Such situations are important enough to be discussed in literature, with emphasis put on the fact that it is possible for an expert to make a justified mistake.[36]

Similarities between records mainly consisting of signatures also need to be discussed — they are a result of copying or imitation. Copied signatures include numerous analogies to the model; however, apart from them they can betray more or less distinct features which testify to forgery and are manifested by the graphic line patterns lacking smoothness and shading, demonstrating high pressure, irregular tremor, the presence of points where the writing agent was stopped, retouches, secondary lines, added graphic elements, ink stains in line breaks in the case of facsimiles. In signatures copied using a printer, this procedure will be identifiable by an analysis of characteristic decomposition of the covering agent (toner or ink).[37]

Similar features may occur between the model and imitated signature. Their intensity and quality depends on the imitation method applied. In the case of exact imitation, signatures may be distinguished by high construction compatibility with the model, whereas the signatures reproduced from memory are distinguished only by superficial compatibility with the model. An exception can be a signature reproduced from memory preceded by the writer's training on how to write it. In this case, compatibilities can be delusive. However, in addition to the existing analogies between records, there may be more or less visible features indicating forgery (depending on the method of imitation). They are manifested both in the course of the graphic lines, including its smoothness, shading, pressure, as

[33] As T. Widła indicated in the analysis, it is around one feature.

[34] T. Widła, "Cechy płci…", p. 81.

[35] T. Widła, "Przypadkowe…", pp. 386–389.

[36] Ibid., pp. 386–388.

[37] E. Gruza, M. Goc, J. Moszczyński, *Kryminalistyka, czyli rzecz o metodach śledczych*, Warszawa 2008, p. 387.

well as in graphic solutions, especially the more complex ones, and in details, the drafting of which reduces the writer's attention and thus reveals different writing habits characteristic of a forger.[38]

The types of similarities listed above do not constitute a closed catalogue, as there are numerous factors affecting and shaping handwriting. Many of them became the basis for the proposed identification methods aimed at group identification of the author of a record on the basis of analogies in handwritings produced under the influence of internal or external factors, depending on the state of the writer and on the conditions in which records are produced.

Another criterion for classification of similarities present in records, which seems important from the identification point of view, is their weight, which has a fundamental impact on the correctness of the opinion-making process. According to this rule, one can distinguish transcripts containing similarities which do not pose a risk of erroneous opinion-making, provided that it is a result of reliable research conducted in compliance with the adopted rules of the research method applied. This group includes, for example, some family, professional, gender, or even accidental similarities. Another type of similarities encompasses ones which may, unfortunately, become the reason for an expert's error, even if it is involuntary. This group can include the analogies which are also tracked in the factors listed above.

Similarities in handwritings can also be divided into those introduced consciously and unconsciously. Conscious imitation of graphic solutions certainly regards environmental similarities, especially the ones among friends or family members. Introducing similar graphic solutions is also a characteristic feature of copied and imitated records.

An important problem within the scope of the discussed issues is to determine what kind of features or groups of features are susceptible to similarities and whether it is possible to determine certain regularities in terms of their quality. Material from opinion-making practice may be useful in this area, but for obvious reasons it cannot provide exhaustive guidance. In one of the cases, similar features appearing in signatures actually originating from different people were visible in construction solutions and details of the structure of certain letters as well as the graphic arrangement of the signature endings.[39] In the description of another case, the convergence between signatures of different people concerned selected topographic, and measurement features, including the proportion of the size of middle zone and upper zone elements, the course of the base and cover line, the modelling of some signs, or their graphic details.[40] In another case, similarities covered the structure of selected signs (letters and figures) as well as their proportion, initiation methods for some letters, particular connecting strokes, the

[38] Ibid., pp. 387–389.

[39] T. Tomaszewski, "Zbieżne cechy grafizmu źródłem pomyłki biegłego", *Człowiek i Dokumenty* 15, 2009, p. 48 ff.

[40] T. Tomaszewski, "Ku przestrodze…", pp. 52–58.

modelling of diacritical marks, the structure of some groups of graphic signs, analogous hand movements which produced a specific letter group, and spaces between numbers.[41] Different material encompassed similarities which were identified in the proportions of upper zone elements (they were shortened), in the structure of particular graphic signs regarding their endings, in gramm connections, in embedding diacritical marks, in size proportions within certain groups of signs, in modelling certain letters.[42]

As the description of the above cases shows, similarities in the handwritings of different persons may relate to various features considered as part of their specific groups according to the catalogue of handwriting features,[43] i.e. synthetic, topographic, and measurement features — the proportions of the elements of graphic signs, structural solutions of signs and sign groups — building and modelling the handwriting signs, letter and inter-letter connecting strokes, initial and final adjustments, placing and modelling diacritical marks, analogous hand movements performed when writing certain graphic signs and their groups. Undoubtedly, the most visible are the features related to the similarity of a general image of handwriting, its development level, as well as to the structure of certain graphic signs and their groups. At the same time, some motor features of handwriting, such as the pen pressure rhythm, are relatively resistant to the occurrence of similarities in records produced by different persons.

Unfortunately, an expert's failure to take into account similar graphic solutions in the records of different persons as a natural phenomenon can become a source of judicial errors. The consequence of this approach is assigning too much or too little identification value[44] to the features of handwriting, attaching too much importance to the analogies present in the records and, at the same time, diminishing the significance of the discrepancies occurring in them. Another reason for errors during the opinion-making process can be inadequate comparative material submitted for research purposes, whereas it should be stressed that access to the proper one is not always possible. The most difficult cases are when handwriting originates from a different person unrelated to the accused party and at the same time there are no details suggesting such an option. On the contrary, it is easier to collect a relevant comparative material if an assumption can be made that the record has been produced by a relative or relatives, which may emerge from the circumstances of the case and from its context. In such situations, the court expert should apply to the judicial body for samples from the family circle.[45] Apart from negligence, what is also dangerous for the shape of the final expert opinion is yielding to the suggested course of the proceedings, the results of which at a given stage may indicate that the

[41] T. Widła, "Przypadkowe…", p. 385.
[42] Ibid., pp. 386–387.
[43] A. Koziczak, *Metody pomiarowe w badaniach pismoznawczych*, Kraków 1997.
[44] T. Tomaszewski, "Zbieżne cechy…", pp. 43–44.
[45] T. Widła, "Przypadkowe…", p. 338.

record was produced by the suspect/accused party, and the court expert knows them from the case files.[46] To avoid such complications, the judicial body should consider each time what scope of necessary knowledge about the conducted case shall be provided to the expert. Particularly in the case of the so-called family similarities, if the comparative material originates from several related persons and their handwriting is mutually similar as well as obviously similar to the questioned material, the action procedure requires one to omit the analogous features (i.e. treat them as auxiliary features), focus on the less evident graphic elements which distinguish the subsequent graphisms, and then reverse the sequence of actions by searching for convergences with the features characteristic for the subsequent comparative samples[47] in the questioned material. The appropriate action is to base the conclusion regarding the authorship of a record on the features which are not common for the comparative materials.[48]

However, it seems slightly easier in the case of similarities resulting from a forgery by means of exact imitation or copying, since one of the actions undertaken by the court expert at the initial stage of handwriting expert opinion is to verify whether the records bear traces of copying or imitation.

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