

„Fingerprint Mapping” Project (Part II) – Results

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Abstract

Since the late 20th century, the field of dactyloscopy has witnessed ongoing attempts to create an examination standard that combines the merits of both numerical and holistic standards while avoiding their drawbacks. In recent years, fingerprint examiners, regardless of the standard employed, have begun to recognize the necessity of incorporating the frequency of occurrence of individual fingerprint minutiae types into examinations. In Poland, the first research on this subject was conducted at the turn of the 1960s and 1970s by Professor Czesław Grzeszyk. The results of said research were published in *Problemy Kryminalistyki* No. 96 (1972) and for years constituted the basis of knowledge regarding the frequency of various characteristic types. However, due to the severely limited technical capabilities of that time, the results obtained by Professor Grzeszyk may have been subject to significant measurement error. For this reason, fingerprint experts from the Central Forensic Laboratory of the Police replicated the study on the frequency of occurrence of individual minutiae types in the Polish population, utilizing computer software created specifically for this purpose under the „Fingerprint Mapping” project and applying the catalog of fingerprint characteristics currently in force in police forensic laboratories. This article presents an analysis of the results obtained following the „mapping” of 1,104 fingerprint impressions.

Keywords: dactyloscopy, minutiae, mapping, frequency of occurrence, Polish population

1. Introduction

Dactyloscopy, as the only method allowing for the unequivocal identification of an individual, has been employed for this purpose since the late 19th century. As recently as the early 21st century, it remained the premier forensic discipline for identification purposes. However, following the publication of the 2009 report by the National Research Council for the U.S. Department of Justice (*Strengthening Forensic Science in the United States: A Path Forward*) – which exposed profound systemic deficiencies regarding examiner competencies, authorization protocols, and the principles governing fingerprint examination conclusions in the U.S. – dactyloscopy became the subject of intense global scrutiny.

Although the report addressed the situation exclusively within the United States – where the holistic standard is prevalent, imposing no rigid limitations or rules and relying solely on the subjective

assessment and experience of the examiner – the debate ignited by its publication extended to European countries, which predominantly adhere to the numerical standard. This reignited interest in the hitherto unresolved challenge of establishing a novel fingerprint examination standard. Ideally, such a standard would combine the merits of the numerical approach (clear, transparent, structured rules; foundations rooted in statistical calculations) with those of the holistic approach (consideration of the evidential value of minutiae based on type and location, inclusion of third-level details, scars, etc.), while mitigating the inherent drawbacks of each. Attempts to develop such a standard were previously undertaken between 1998 and 2004, when two successive expert groups – the Interpol European Expert Group on Fingerprint Identification I and II – endeavored to create a new, universally accepted approach, albeit unsuccessfully (Kozdrój-Miler, Klemczak, 2019a).

Currently, fingerprint experts in many nations recognize that determining the frequency of oc-

currence of specific minutiae types within a given population is pivotal for both standards. In the context of the numerical standard, utilizing frequency data would facilitate the weighting of the identification value of individual minutiae, whereas for the holistic standard, it would provide a „scientific,” statistical foundation. To date, such studies have been conducted in Spain (Gutiérrez et al., 2007; Gutiérrez-Redomero et al., 2011), Argentina – across four ethnic groups: Ramal, Puna-Quebrada, Buenos Aires, and Chubut (Gutiérrez-Redomero et al., 2012; Rivaldería et al., 2017), the USA – in two ethnic groups: African American and European American (Fournier, Ross, 2016), India – the North Indian Punjab population (Thakar et al., 2018), China (Gao et al., 2023), Nigeria – in two ethnic groups: Igbo and Yoruba (Akpan et al., 2019), and Brazil (da Silva Gomes et al., 2024).

In Poland, this issue was previously addressed in the late 1960s by Professor Czesław Grzeszyk. In his research, he distinguished and reported the frequency of occurrence for 20 types of minutiae (Grzeszyk, 1972). However, the obtained data may have been subject to significant measurement error, as collection relied solely on a manual method using a magnifying glass due to the lack of appropriate research equipment.

Consequently, the expert team from the Fingerprint and Traseology Department of the Central Forensic Laboratory of the Police (CFLP) decided to replicate the study on the frequency of occurrence of individual fingerprint minutiae types in the Polish population. The study examined 13 types of minutiae distinguished in the „Katalog podstawowych klasycznych cech szczególnych układów linii papilarnych (MINUCJI) wykorzystywanych w badaniach z zakresu identyfikacji daktyloskopijnej” (CLKP, 2024)”, which is the standard in Polish police forensic laboratories. Furthermore, the research utilized „CLKdb” software, developed under the „Fingerprint Mapping” project, which facilitates the collection of fingerprint data and statistical analysis. This article presents the results obtained following the examination (mapping) of 1,104 fingerprints.

2. Material and Methods (Kozdrój-Miler, Klemczak, 2019b)

2.1. Source of Fingerprint Impressions

The study utilized inked fingerprint cards retrieved from the archives of the Central Forensic Laboratory of the Police (CFLP). The fingerprints belonged to deceased individuals and, consequently, did not constitute personal data within the meaning of applicable legal regulations. The fingerprint images were scanned at a resolution of 600 pixels per cm and saved in JPEG format. The scanning process was restricted exclusively to the fields containing rolled fingerprint impressions (fields numbered 1 through 10, excluding the section containing descriptive data and plain impressions). For further processing, high-quality impressions (legible, unblurred) with dimensions of at least 2.5 x 2.5 cm

were selected from the scanned cards.

2.2. Preparation of Scanned Impressions

The scanned fingerprint images underwent graphic processing using Adobe Photoshop CS6 software. Where necessary, the quality and legibility of the scanned image were enhanced using the basic tools available in Adobe Photoshop CS6, i.e., „Auto Tone,” „Auto Contrast,” „Auto Color,” „Brightness/Contrast,” „Levels,” „Curves,” „Exposure,” and „Black & White.” Subsequently, squares with a side length of 2.5 cm were cropped from the scanned images. The cropping procedure was conducted in strict adherence to the principles detailed in the „Instruction for Coding Fingerprint Images” (Kozdrój-Miler, Klemczak, 2019).

The general cropping principles for the three fundamental pattern types (pattern classification according to J. Moszczyński; Moszczyński, 1997) are presented below:

1. Arch patterns:

Plain arches: Vertical axis – 1 cm below and 1.5 cm above the boundary line between the base and the canopy of the pattern; Horizontal axis – 1.25 cm from the line perpendicular to the boundary line, bisecting the highest points of the ridges forming the canopy.

Tented arches: The intersection of the diagonals of the 2.5 cm square aligns with the point designating the center (in the vertical axis) of the element forming the mast.

2. Loop patterns:

The intersection of the diagonals of the 2.5 cm square aligns with the point designating the inner terminus (core) of the pattern (inner termini determined according to J. Moszczyński; Moszczyński, 1997).

3. Whorl patterns:

The intersection of the diagonals of the 2.5 cm square aligns with the point designating the center of the central element of the whorl (the center of the innermost circle, ellipse, spiral, etc.).

2.3. Coding of Fingerprint Images

The coding (mapping) of the previously prepared fingerprint images was performed using the proprietary software „CLKdb,” developed for the CFLP by an external contractor under the „Fingerprint Mapping” project. The images were coded exclusively by forensic fingerprint experts, utilizing the „Instruction for Coding Fingerprint Images,” which strictly defined the procedure. Upon opening a fingerprint image in the software, the experts placed markers on the image at the appropriate locations corresponding to the specific minutiae types present in the impression. A selection of 13 distinct minutiae marker types was available, corresponding to the 13 minutiae types distinguished in the „Catalog of Basic Classical Fingerprint Characteristics (MINUTIAE) Used in Fingerprint Identification” (Fig. 1),

which constitutes an annex to the research methodology (CFLP, 2024) currently in force at the CFLP and the Forensic Laboratories of the Provincial/Capital Police Headquarters. These are defined as follows:

- Beginning of a ridge: The point where a friction ridge commences its course.
- Ridge ending: The point where a friction ridge terminates its course.
- Bifurcation: The point where a friction ridge divides, giving rise to two continuing ridges.
- Convergence: The point where two friction ridges meet, merge, and continue as a single ridge.
- Short ridge: A short friction ridge of normal width and a length ranging from 2 to 5 times the width of the line.
- Dot: The shortest friction ridge of normal width and a length approximating said width (not exceeding twice the line width).
- Lateral contact: The point of contact between two friction ridges overlapping one another, i.e., the non-collinear arrangement of the beginning and ending of two friction ridges situated side by side.
- Hook (Spur): A bifurcation or convergence of a friction ridge and a short ridge; the short ridge may appear at the top or bottom, and on the left or right side of the line.
- Enclosure (Eyelet): A bifurcation of a friction ridge that, after a short course (not exceeding the length of a short ridge, i.e., 5 times the line width), transitions into a convergence; enclosures may appear as circles, ellipses, or ovals and may be symmetrical or asymmetrical (on one side or the other of the main friction ridge).
- Passing ridge: A point where one friction ridge runs obliquely (from one side to the other) through a break in a second friction ridge.
- Bridge: A short ridge connecting two adjacent (parallel) friction ridges.
- Intersection: A point where two adjacent friction ridges cross paths.
- Break: A point where the course of a friction ridge is not continuous, i.e., the linear arrangement of the beginning and ending of a friction ridge situated at a distance of 2 to 5 times the width of the line (the length of a short ridge) from each other.

To ensure correct and homogeneous coding, the experts – in addition to strictly adhering to the minutiae definitions contained in the instruction – paid particular attention to the correct determination of the friction ridge flow direction. They utilized tools available in the software (image magnification, grid overlay) and, when necessary, measurement instruments such as a ruler/scale and/or dividers. Once fully coded, the fingerprint images were saved under an individual designation in the software database.

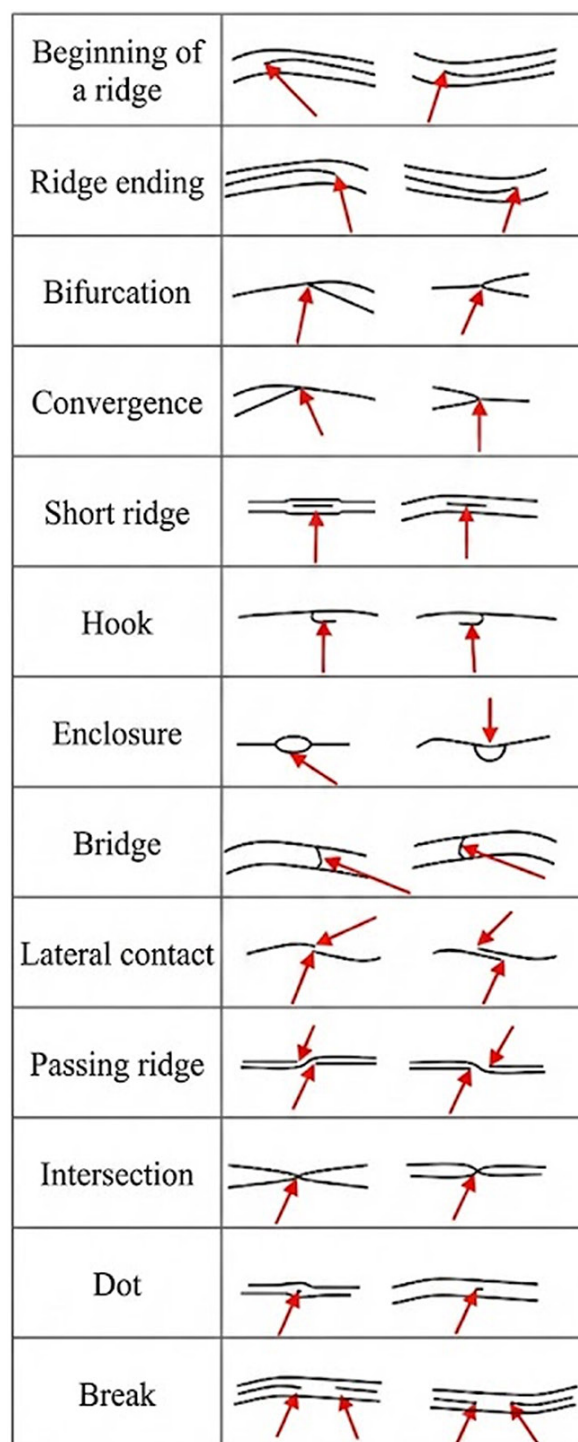


Fig. 1. Basic classical fingerprint characteristics (MINUTIAE) used in fingerprint identification examinations

2.4. Minutiae Counting and Statistical Analysis

The number of minutiae of individual types, their percentage share in the total, and the total number of coded characteristics were calculated automatically.

3. Results

The study involved the mapping of 1,104 fingerprint impressions, yielding a total of 92,893 coded minutiae.

The most prevalent group, accounting for over half of all coded characteristics, comprises ridge beginnings and ridge endings – types frequently treated by

researchers as a single category (25.92% and 25.83%, respectively). Bifurcations (16.76%) and convergences (15.69%) rank second. Collectively, these four minutiae types constitute over 84% of all fingerprint characteristics.

The remaining minutiae types are encountered with significantly lower frequency and can be categorized into three groups. The first group includes types representing a few percent of all minutiae each: short ridges (4.36%), dots (3.11%), and hooks (2.50%). The second category consists of characteristics occurring with a frequency of approximately 1-1.5%: lateral contacts (1.77%), enclosures (1.31%), breaks (1.07%), and passing ridges (1.00%). The third group comprises the rarest minutiae, appearing with a frequency significantly below 1%: bridges (0.57%) and intersections (0.11%). Detailed results are presented in Table 1.

Tab. 1. Frequency of occurrence of individual minutiae types in the Polish population (CFLP, N = 1,104)

Minutiae type	Count	Frequency
Beginning of a ridge	24 081	25,92%
Ridge ending	23 998	25,83%
Bifurcation	15 568	16,76%
Convergence	14 576	15,69%
Short ridge	4 046	4,36%
Dot	2 887	3,11%
Hook	2 321	2,50%
Lateral contact	1 644	1,77%
Enclosure	1 217	1,31%
Break	995	1,07%
Passing ridge	927	1,00%
Bridge	530	0,57%
Intersection	103	0,11%
TOTAL	92 893	100%

4. Discussion

4.1. Results of the Polish Population Study

The frequency of occurrence of individual minutiae types in the Polish population was previously investigated by Professor Czesław Grzeszyk, and the results of said research were published in 1972 in *Problemy Kryminalistyki* (Table 2). Although Professor Grzeszyk distinguished a significantly larger number of minutiae types in his work, the results of both studies exhibit a high degree of concordance. When analyzing exclusively those minutiae types considered in the present study [the 12 types included in the „Catalog of Basic Classical Fingerprint Characteristics (MINUTIAE) Used in Fingerprint Identification,” excluding the „break” type, which was not accounted for in Professor Grzeszyk’s research] and ranking them by frequency of occurrence, an almost identical distribution is obtained:

In Professor Grzeszyk’s study: beginning of a ridge, ridge ending, convergence, bifurcation, short ridge, dot (point), lateral contact, hook, enclosure, passing ridge, bridge, intersection.

In the present study: ridge ending, beginning of a ridge, convergence, bifurcation, short ridge, dot, Enclosure, Hook, Lateral contact, Passing ridge, Bridge, Intersection.

Tab. 2. Frequency of occurrence of individual minutiae types in the Polish population (C. Grzeszyk, N = 1,405, data exclusively from adult fingertips)

Minutiae type	Count	Częstość
Beginning of a ridge	10 137	23,17%
Ridge ending	13 360	30,54%
Bifurcation	3 953	9,03%
Convergence	5 941	13,58%
Short ridge	2 760	6,30%
Dot	2 289	5,23%
Hook	1 334	3,05%
Lateral contact	1 096	2,51%
Enclosure	1 344	3,07%
Other	655	1,51%
Passing ridge	430	0,98%
Bridge	406	0,93%
Intersection	44	0,10%
TOTAL	43 749	100%

Upon examining the percentage share of individual minutiae types, significant disparities can be observed in certain instances (Table 3). These differences are certainly not attributable to the use of differing catalogs of characteristics, as the 8 additional minutiae types distinguished by Professor Grzeszyk (i.e., double convergence, double bifurcation, trifurcation, triple convergence, triple bifurcation, double enclosure, twin bridge, M-type minutia) collectively constitute approximately 1.5% of all characteristics. The same applies to the distinction of an additional minutiae type in the present study, i.e., the break; its frequency of occurrence is approximately 1%, and thus it does not significantly impact the obtained results.

Tab. 3. Comparison of results obtained by the CFLP and by Prof. Grzeszyk (data from adult fingertips)

Minutiae type	CLKP (N = 1 104)		prof. C. Grzeszyk (N = 1 405)	
	Liczba	Częstość	Liczba	Częstość
Beginning of a ridge	24 081	25,92%	10 137	23,17%
Ridge ending	23 998	25,83%	13 360	30,54%
Bifurcation	15 568	16,76%	3 953	9,03%
Convergence	14 576	15,69%	5 941	13,58%
Short ridge	4 046	4,36%	2 760	6,30%
Dot	2 887	3,11%	2 289	5,23%
Hook	2 321	2,50%	1 334	3,05%
Lateral contact	1 644	1,77%	1 096	2,51%
Enclosure	1 217	1,31%	1 344	3,07%
Passing ridge	927	1,00%	430	0,98%
Bridge	530	0,57%	406	0,93%
Intersection	103	0,11%	44	0,10%
TOTAL	91 898	98,93%	43 094	98,49%

Given that the inheritance of fingerprint patterns is indirect and polygenic, thereby exhibiting high stability and resilience to genetic drift (Fournier, Ross, 2016), the temporal interval between the studies (approximately 50 years) cannot have influenced the results. The most plausible explanation for the observed discrepancies appears to be differences in research methodology, though not those related to the type of collected material. Professor Grzeszyk enumerated characteristics appearing not only on fingers but also in four specific palm areas selected by him. Additionally, his study included children aged 2 years and above (constituting over half of all subjects), in whom the correct determination of minutiae types could pose significant challenges due to the small size of the examination area and high ridge density. Therefore, to eliminate the influence of the aforementioned factors on the results, only data collected from adults and pertaining to fingertips were selected from Professor Grzeszyk's work for comparison with modern results.

Of far greater significance to the obtained results may have been the selected size of the examination area. In Professor Grzeszyk's work, the examination fields on fingertips consisted of circles with a radius equal to the width of 15 friction ridges and the intervening spaces, centered on the pattern core. This yields an area strictly concentrated around the pattern core and more than 50% smaller than the examination fields designated in the present study. It is possible that this is the primary cause of the observed differences, as research conducted by other teams indicates that minutiae types appearing near the pattern core are morphologically more complex than those on the periphery, and that their frequency of occurrence is markedly higher, resulting in greater diversity and complexity in this region of the pattern (Gutiérrez-Redomero et al., 2011).

A second probable cause of the observed differences may be the fact that Professor Grzeszyk's research was subject to a larger measurement error due to the technical limitations of that time—collecting

and recording data „manually” increases the probability of irregularities in both the counting and classification of individual minutiae types. Evidence of this may be found in the uneven distribution of minutiae types such as ridge beginnings (23.17%) and ridge endings (30.54%), as well as bifurcations (9.03%) and convergences (13.58%) in the work from the 1970s. The division into beginnings/endings and bifurcations/convergences does not stem from morphological differences; it is purely arbitrary and depends solely on the direction of the friction ridge flow (Moszczyński, 1997). Many researchers and fingerprint experts do not account for this distinction at all, regarding beginnings/endings and bifurcations/convergences as two, rather than four, minutiae types. Consequently, there is no rationale for corresponding minutiae of the aforementioned types to occur with differing frequencies – their quantitative distribution should be similar. Such results were indeed obtained in the present study: beginnings and endings occurring with a frequency of 25.92% and 25.83%, respectively, and bifurcations and convergences – 16.76% and 15.69%, respectively.

Despite the occurrence of the aforementioned differences in the percentage share of individual characteristic types, the general trends are preserved. In both cases, the most prevalent minutiae types, constituting over 50% of all characteristics, are the beginning and ending, followed by the bifurcation and convergence. Subsequently, in both instances, characteristic types appear whose frequency does not exceed a few percent: short ridge, dot/point, lateral contact, hook, enclosure, and passing ridge. Conversely, the two rarest minutiae types (with a frequency below 1%) in both studies are the bridge and the intersection. This provides a basis for considering the results presented in this work as appropriate and correct for the Polish population.

4.2. Results of Studies on Other Populations

As mentioned in the introduction, the necessity of scientifically determining the frequency of occurrence

of individual minutiae types within a given population has been recognized by researchers and fingerprint experts in many countries. Table 4 presents a comparison of the frequency results for selected minutiae (included in the majority of studies) obtained from eight countries, including Poland, for a total of thirteen ethnic groups.

computer software or purpose-built software, to research utilizing machine learning systems (deep convolutional neural networks).

Method of result presentation: Results were presented: broken down by individual fingers, by pattern type (arches, loops, whorls), or by sex; results were reported as the average frequency of minutiae per im-

Tab. 4. Comparison of frequency results for individual minutiae types across eight populations (thirteen ethnic groups)

MINUTIAE	POPULATION (minutiae frequency in %)												
	1	2	3	4	5	6	7	8	9	10	11	12	13
beginning of a ridge/ ridge ending	51,75	60,39	50,14	51,69	53,94	55,18	56,75	60,10	49,82	69,65	6,87	5,45	44,00
bifurcation/convergence	32,44	29,01	40,36	38,18	34,78	31,51	28,8	24,70	41,33	26,82	52,01	57,97	34,37
short ridge	4,35	4,63	2,59	3,7	4,07	5,54	10,3	11,75	3,91	1,58	12,49	12,30	3,87
dot	3,10	1,70	0,55	1,14	2,03	1,42	1,9	1,65	1,17	-			2,98
lateral contact	1,76	0,76	0,75	0,79	1,00	1,60	-	-	0,09	-	4,59	3,30	1,76
enclosure	1,31	1,33	1,68	1,75	1,56	1,43	2,25	1,8	2,73	0,48	3,74	3,31	2,01
break	1,07	1,08	0,81	1,12	1,01	1,47	-	-	0,20	-	4,59	2,77?	2,75
passing ridge	0,99	0,51	1,33	0,81	0,84	1,38	-	-	0,11	0,32	3,02	2,82	1,41
bridge	0,57	0,36	1,23	0,58	0,42	0,29	-	-	0,44	-	9,88	10,45	1,20
intersection	0,11	0,11	0,22	0,08	0,19	0,06	-	-	0,15	-	-	-	0,57

Populations: 1 – Poland, 2 – Spain, 3 – Argentina, Ramal ethnic group, 4 – Argentina, Puna-Quebrada ethnic group, 5 – Argentina, Buenos Aires ethnic group, 6 – Argentina, Chubut ethnic group, 7 – USA, African American, 8 – USA, European American, 9 – India, North Indian Punjab population, 10 – China, 11 – Nigeria, Igbo ethnic group, 12 – Nigeria, Yoruba ethnic group, 13 – Brazil

In the analyzed research papers (Grzeszyk, 1972; Gutiérrez et al., 2007; Gutiérrez-Redomero et al., 2011; Gutiérrez-Redomero et al., 2012; Fournier, Ross, 2016; Rivaldería et al., 2017; Thakar et al., 2018; Akpan et al., 2019; Gao et al., 2023; da Silva Gomes et al., 2024), significant methodological discrepancies were observed, including, among others:

Minutiae: The number of types included in the studies varied within a vast range from 5 to 54; different, non-overlapping minutiae types were selected for study, and individual types were defined differently by different researchers.

Examination fields: The studies differed in the method of delineation, size, and/or shape of the examination field.

Research material: Some studies included data derived only from selected fingers (e.g., exclusively from index fingers or exclusively from index and middle fingers), whereas other studies considered all fingers or fingers and palms.

Fingerprint donors: Individual studies selected: exclusively adolescents (16 - 18 years), exclusively young adults (e.g., 20 - 35 years), adults of various ages (e.g., 18 - 60 years), or adults and children (while age does not influence the frequency of occurrence of individual minutiae types in accordance with the principle of permanence, the correct determination of minutiae types may be hindered when children or the elderly are selected as donors).

Equipment/Technical capabilities utilized: Vast differences existed in this regard across the analyzed studies: from research conducted solely using a magnifying glass, through studies utilizing generally available

pression or frequency of occurrence in the population; results were also reported with varying precision (two or three decimal places).

Evaluators/Determinators of minutiae types: Research was conducted: exclusively by anthropologists, exclusively by fingerprint experts, or jointly by anthropologists and fingerprint experts.

Due to the existence of the aforementioned discrepancies, averaged values are presented in Table 4 to facilitate even a cursory comparison of results. In cases where a study employed a breakdown by individual fingers, the table includes the average result obtained for all examined fingers; where a study employed a breakdown by sex, the table includes the average result obtained for both sexes combined, etc. Additionally, all results have been rounded to two decimal places. In the case of results concerning Poland, the table presents values obtained in the present study using proprietary computer software.

Although the obtained results can only be compared indirectly due to the aforementioned differences in research conduct, the general trend is clearly visible and consistent with the results obtained in the studies conducted by the CFLP. The most prevalent minutiae types are the beginning/ending (from 44% to approx. 70%) and the bifurcation/convergence (from approx. 25% to approx. 41%), whereas the two rarest types are the bridge (approx. 0.3 - 1.2%) and the intersection (approx. 0.06 - 0.6%). The remaining minutiae types occur with varying frequency across individual studies,

typically not exceeding a few percent.

The sole deviation from this rule is found in the results obtained by researchers from Nigeria (Akpan et al., 2019). In these studies, the most prevalent minutiae type is the bifurcation/convergence (over 50%). The bridge, which in other studies belongs to the two rarest minutiae types, appears with a high frequency of approximately 10%, whereas the beginning/ending occurs with an unprecedentedly low frequency not exceeding 7%. These results deviate markedly from all others, including those for the African American population (Fournier, Ross, 2016), suggesting that they may stem from a methodological error rather than representing a factual depiction of the frequency of individual minutiae types in the examined ethnic groups.

5. Conclusions

The analysis of the conducted research indisputably demonstrates that large and significant differences exist in the frequency of occurrence among individual fingerprint minutiae types. This implies that their identification value varies and they should not be treated equivalently. Consequently, the priority issue for dactyloscopy, both in Poland and globally, should be the prompt development of an examination standard that accounts for the identification value of minutiae.

Undoubtedly, research concerning the frequency of occurrence of individual minutiae types must be continued to ensure that any newly developed standard is grounded in scientific principles and based on statistical cal-

culations rather than the internal conviction of an expert. Indeed, research published in 2024 has shown that the subjective assessment of the identification value of individual minutiae types can vary not only between experts but also within the assessments of a single expert re-examining the same marks after a significant time interval (Quigley-McBride et al., 2024).

The final, and perhaps most critical matter, is the necessity of systematizing and unifying research methodology to enable the comparison of results obtained by researchers from different countries. Given the currently existing methodological differences, only an indirect, general comparison is possible. This does not provide an answer as to whether the observed discrepancies in results represent actual differences between specific populations or stem rather from the aforementioned variations in research conduct. The most crucial and fundamental issue should be the development of a common catalog of fingerprint minutiae, as the differences existing at present encompass not only the number of distinguished types (ranging from 5 to 54) but also nomenclature and definitions – the same minutiae types appear under several different names, or different minutiae types are designated by the same term (Eldridge et al., 2023). The creation of a common international „language” for dactyloscopy should be a priority in the coming years for organizations such as The International Association for Identification (IAI) or The European Network of Forensic Science Institutes (ENFSI). Otherwise, dactyloscopy will continue to be regarded – albeit undeservedly – as subjective and „unscientific.”

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Sources of Figures and Tables

1. Fig. 1. – WBDiT CFLP proprietary archive (modified)
2. Tab. 1-4. – Authors' own elaboration