

ORIGINAL ARTICLE

Differentiation and Comparison of Left Handed and Right Handed Writers

Baraa K. Mohamed¹, Ali A. Agha², Thamer A. Rehan³, Asmaa M. Abdul Rasoul⁴,
Mahmoud A. Hussein⁵, Firas H. Abdulrazzak⁶, Ayad F. Alkaim⁷

HOW TO CITE THIS ARTICLE:

Baraa K. Mohamed, Ali A. Agha, Thamer A. Rehan, et al. Differentiation and Comparison of Left Handed and Right Handed Writers. J Forensic Chemistry Toxicol. 2025; 11(2): 77-83.

ABSTRACT

Handwriting is a real method for shows the presences feeling and requirements, which influence with the skills and academic achievement. The hand and the skills of hand if right hand or right hand influence with the degree of Skill mastery. In this work the skills of writing by right or left hand was tested with two languages which is Arabic and English. The compare not only in the nature of writing with skills the persons but also the direction of writing which influence with the slant of writing hand. Most of concerning was the writing with left hand as case study with right hand as standard sample with two languages for 5 persons who's the native languages are Arabic. The results show that left hand was influence with the direction of writing when tested with English languages which did not change with Arabic languages.

KEYWORDS

• LH and RH • Arabic • English • Slant • Direction

INTRODUCTION

In our previous work we discuss the term of evidence and explain many details which related to this term starting from definitions

and types and ending with the strategy for identified, in addition to looking for many circumstance that deal with it.¹ Determining characteristics for peoples such as gender, age, and handwriting from handwriting is a

AUTHOR'S AFFILIATION:

¹ Forensic Department, College of Science, University of Al-Karkh, Baghdad, Iraq.

² Forensic Department, College of Science, University of Al-Farahidi, Baghdad, Iraq.

³ Forensic Department, College of Science, University of Al-Karkh, Baghdad, Iraq.

⁴ Forensic Department, College of Science, University of Al-Karkh, Baghdad, Iraq.

⁵ Forensic Department, College of Science, University of Al-Turath, Baghdad, Iraq.

⁶ Forensic Department, College of Science, University of Al-Karkh, Baghdad, Iraq.

⁷ Chemistry department, College of Science for Women, University of Babylon, Babylon, Iraq.

CORRESPONDING AUTHOR:

Firas H. Abdulrazzak, Forensic Department, College of Science, University of Al-Karkh, Baghdad, Iraq.

E-mail: firas_habeeb2000@kus.edu.iq

➤ Received: 22-09-2025 ➤ Accepted: 13-11-2025



Creative Commons Non Commercial CC BY-NC: This article is distributed under the terms of the Creative Commons Attribution NonCommercial 4.0 License (<http://www.creativecommons.org/licenses/by-nc/4.0/>) which permits non-Commercial use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the Red Flower Publication and Open Access pages (<https://www.rfppl.co.in>)

critical requirement in forensic cases, due to examination of Document can eliminate and recognize many suspects using this technique.²

Handwriting important requirement to identify many events in forensic fields such as forgery and counterfeiting, thus it should be start with important statistic information for this part. The information reported that majority people population reach to 89% of the human population writes with right hand RH while 9% only refers to people whose writing by left hand LH and the rare behavior was ambidextrous R&LH with 2%.³

The distribution for people whose write with LH was 4.95% for males to 4.05% for females respectively. When make compare for male and female whose writing with RH, the results show that 45.2% was female and 43.7% was male.⁴ In forensic field the handedness identification very important to understand many events in crime scene, thus watch position and wallet placement could refer to the user hand. For example, one of applications for this sections suicide note and placement of suicide weapon given indicator for the crime is suicide or Murder, whether intentional or unintentional.⁵

The type of language or style of lettering used to express meanings or events, by written language, relies on used of symbols expressing letters and linking them to the language's specific style. This gives the letter its intended meaning, which is supposed that reflect the apparent or hidden intent of the expression.⁶ Each language has its own apparent characteristics, especially regarding the nature of writing and letters shape direction, for example, right to left direction and vice versa, or from top to bottom direction.

Scientific research has shown that used of LH nothing about a child's aptitude or ability, which is congenital, in addition to many literatures mentioned that the right side of the brain is more pronounced which causing the higher percent of the used RH for writing.⁷ The disadvantages for the LH writers was their hands above the writing for important requirements which is make the writers able to see what they are writing. The disadvantage in the LH was not founded in the RH which may be the reason behind the high ratios for presences who able to write by the right hand.

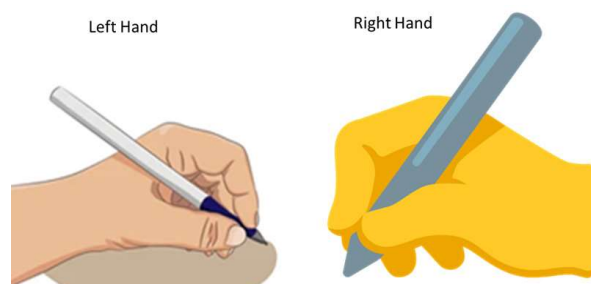


Figure 1: Skim for left hand writing LH and right hand writing RH

An ambidextrous R&LH person is able to perform tasks with two hands equally, but still learning this skill will primarily prefer to use the dominant hand.⁸⁻⁹ The hand inclination is expression whose differentiation and comparison can help to solve many document as well as forgery cases. it is possible to describe what kind of differences occurred in the structure of what is wrote but to indicate any highly distinctive conformities beside formulate universal method concerning their occurrence for persons whose writing with RH or LH represent real challenge.⁹ The position of hand with the surface of writing and direction of hand with body influence with the slant feature when "RH writers slant forward while LH writers slant backward" which is important requirement for distinguish in English writing or generally for the writing from left to right direction.¹⁰ Typical, handwriting quality for People depend on handwriting shape, nature of drawing letter, hand which able to write (left or right), academic achievement for writer. Mostly the general role mentions that both left or right-handed people able to produce controlled, intelligible, and attractive handwriting.¹¹

A person who impersonates a hand to forge a document, by the right hand instead of the left and vice versa, the reaction shown imitation writing appear but with a varying in quality level performance of the handwriting. Thus, differentiation and comparison of LH and RH writers on the basis of slope and stroke of letters plays an important role to identify an individual in document cases.¹² The aim of the research is to estimate the writing slant and compare for people who use LH and people who use RH for both languages Arabic and English. The compare did not deal with the quality of writing, which means of the beauty of the line and the artistic style of connecting

letters to form sentences, but it deals with the slant direction for two style of languages.

METHODOLOGY

In this study, 5 samples were selected to make compare between Arabic and English language with two sections: the first was test and from each subject 3 samples were collected making total samples 18. All the three samples were able to write (copy) and read without any academic document. The second was tested between 2 subject with 16 samples one of them is can be writing and reading while the other was undergraduate college. The tested Population was classified to one person's RH whose act as standard sample while the other four samples were LH. The age of all the subjects was between 17 years to 27 years. Examinees were told to sit as like without any

exaggeration, affectation, or artificiality in the writing style under adequate light.

RESULTS

The comparison process was preceded by an audit process, which required to analysis the samples, all tested samples was started with the RH writing which followed by LH writing. According to figure 2 test 1, the first section ((Handwriting analysis, forgery and counterfeiting)), it could be seen the skills of writers with variance in levels. The slant of the letters in the opposite direction is clear compared to the standard sample. The same behavior was seen in the same figure 1 second section. It could be seen the cutting a word in half does not necessarily have to be equal, but it could be depending to identify the forger from origin.

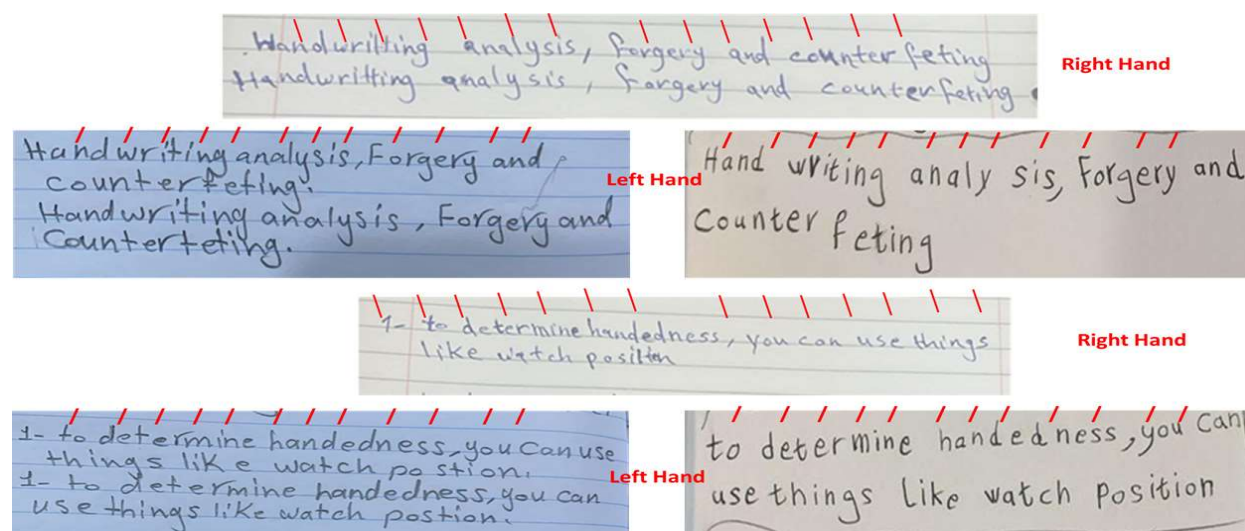


Figure 2: Skim for left and right handwriting (Test 1) with different slant direction in English language

other cases were the linearity for the writing was the same match in addition to slant taken the opposite direction. Third cases should mentions

represent by draw letters in different sentences in same style such "t" in (determine) and (writing), "w" in (writing) and (watch).^{7,13}

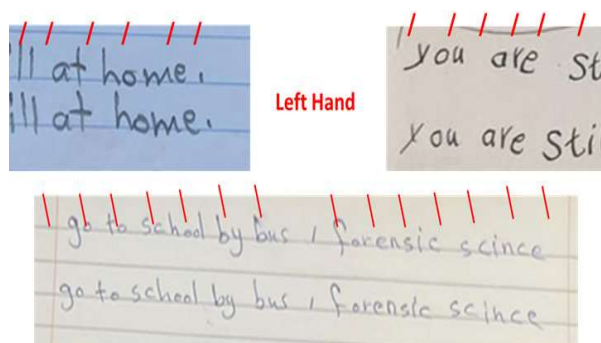


Figure 3: Skim for left and right handwriting (Test 2) with different slant direction in English language

Figure 3 with test 2 include more simple words (you are still at home) and (go to school by bus / forensic science). in this section we deliberately

to make error in one word, the results were not surprise because we found the same behavior.



Figure 4: Skim for left and right handwriting (Test 3) with different slant direction in Arabic language

In figure 4, test 3 was different, which include titles was wrote with Arabic language, may be, still also more clear and that natural results because the language was native for the writer (samples) but that did not prevent the variance in quality. The results show that

slant of writing was not effect in large scale like English writing and that could be related to direction of Arabic writing which is reduce the slant direction.^{5,14} The samples in figure 5 was reported the other samples for LH writing, which also effect of LH on the slant of letters.

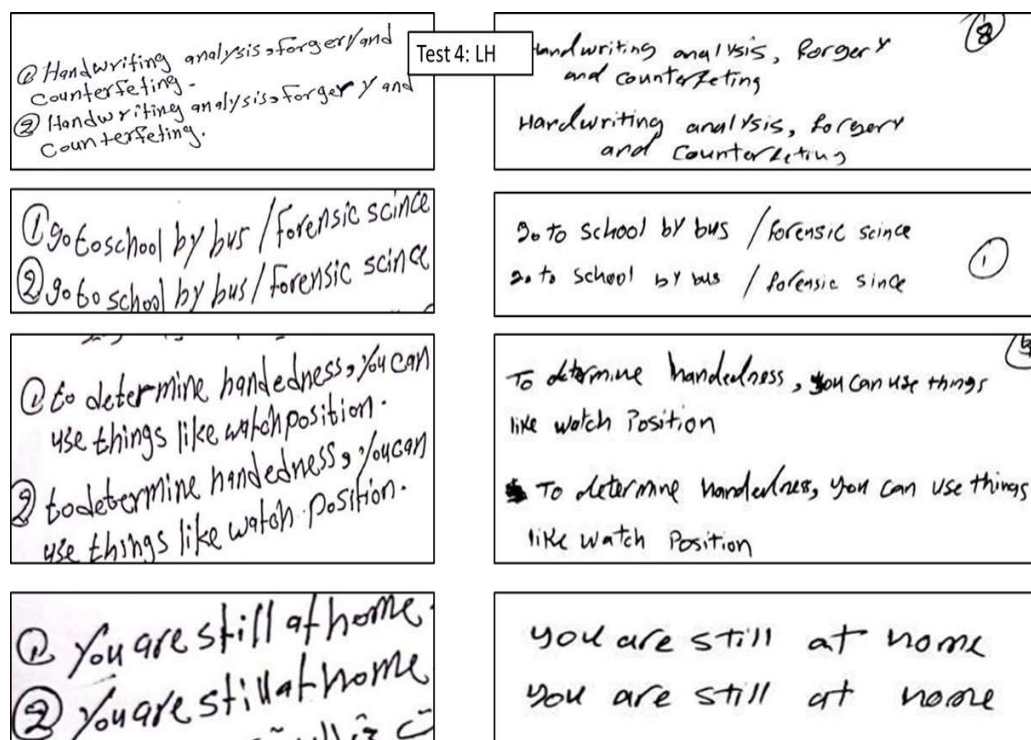


Figure 5: The skim for person (LH) in the left and (RH) in the right, English writing



Figure 5a: The skim for person (LH) in the left and (RH) in the right, Arabic writing

The results of the examination depend on two parameters: First, the samples used were individuals who did not possess advanced academic qualifications (university or postgraduate degrees). Second, the samples studied included individuals who were fluent in reading and writing Arabic but lacked the same proficiency in English, although they lacked the skill to beautifully write in still.

According to these two parameters the results shows that, English writing by the LH sample shown forward slant was so clear in addition to having an apparent backward slant of writing, with change handing write RH and that did not happen with Arabic writing. The right-handed writing, did not shown clear backward slant, as the nature of writing tends to adopt a simple style that relies on imitation without fully revealing the individual characteristics of the writer.⁴⁻⁷ The writing performed in the individuals' native language, Arabic, whether written with the right or left hand, demonstrated more clearly that the characteristics of the individuals were did not related to the forward or backward slant when writing with the right or left hand, respectively.¹⁵ The available analysis is limited to recognized the skim of drawing letters in Arabic or English still and that influence with the abilities for make copy without interaction

between sentences and writer or make copy with emotion.

The style of writing in Arabic or English, indicates the individual ability of the writer, which was favorable Arabic language. Therefore, with the influence of the writer's experience and academic achievement, the writer's true with native personality emerged in the Arabic language, while the artificial personality in the writing style emerged in the English language. The last requirement needed for adapt quickly to change the behavior when start firstly with English letters then to Arabic letters, which means not only change in language but also change in directions and that influence with slant style.⁷⁻¹²

The learn fast, knowledge in different skills, improving skills, enhance ability to learn more languages, definitely important motivators for perfect express feelings and requirements by writing with different languages. Thus experimentally the Arabic language did not show clear change in the slant of letters and that may be related to the direction of writing with variance in influence between left or right hand did not affect.¹⁶ the variance if found was more for shows LH, as compare with RH simulators, which make slant strokes toward the typical writing direction, thus RH not effected in Arabic writing. The last behavior

was different for the English writing as shows in figure 2 and 3 and the slant was very clear with left hand.¹⁷

The results could be related to behavior of writing when Right-handed writers use their thumb to exert pressure on the pencil to push it horizontally in a rightward and upward direction. The middle finger pushes the writing instrument leftward horizontally while pull the instrument down towards the baseline were done by thumb and index finger, which the writing returns. The privilege for this type is able to see the writing as it is being executed due to writer movement is from left to right.¹⁸

CONCLUSION

Maybe we looking for variance or different between RH and LH writing with two languages Arabic and English but that didn't prevent to shows the efficiency for writing according to the direction of writing. According to the results, the nature and degree of slant to draw the letters was shown real change with English language when written by LH due to effect the interactions of fingers with a viewing angle. The mentions parameters were not shown any influence for RH or LH with the nature of slant when writing by Arabic language. The last behavior may have related to the direction of writing which from right to left.

REFERENCES

1. Baraa K. Mohamed, Thamer A. Rehan, Asmaa M. Abdul Rasoul, Mahmoud A. Hussein, Firas H. Abdulrazzak, Ayad F. Alkaim, "Review Article: Forensic Evidence, Classification, Identification, Methods and Techniques", International Research Journal, Volume 12, Issue 8, pp. 482-490, 2025.
2. Alaei, F., Alaei, A. (2022). Handwriting Analysis: Applications in Person Identification and Forensic. In: Daimi, K., Francia III, G., Encinas, L.H. (eds) Breakthroughs in Digital Biometrics and Forensics. Springer, Cham. https://doi.org/10.1007/978-3-031-10706-1_7.
3. David P. Carey, Leah T. Johnstone, "Quantifying cerebral asymmetries for language in dextrals and adextrals with random-effects meta-analysis", Frontiers in Psychology, November 2014, pp. 1-23.
4. De Kovel CGF, Carrión-Castillo A, Francks C. A large-scale population study of early life factors influencing left-handedness. Sci Rep. 2019 Jan 24; 9(1):584. doi: 10.1038/s41598-018-37423-8. PMID: 30679750; PMCID: PMC6345846.
5. Glover James D., Sudderick Zoe R., Shih Barbara Bo-Ju, Batho-Samblas Cameron, Charlton Laura, Krause Andrew L., Anderson Calum, Riddell Jo, Balic Adam, Li Jinxi, Klika, Václav, Woolley Thomas E., Gaffney Eamonn A., Corsinotti Andresen, Anderson Richard A., Johnston Luke J., Brown Sara J., Wang Sijia, Chen Yuhang, Crichton Michael L., Headon Denis J., "The developmental basis of fingerprint pattern formation and variation", Cell, V. 186, S. 5, PP. 940-956, 2023, <https://doi.org/10.1016/j.cell.2023.01.015>.
6. Sinisa Franjic. 2021. Forensics and Applied Linguistics. Int J Forensic Sci. 3: 27-33.
7. Alaei, F., Alaei, A. (2022). Handwriting Analysis: Applications in Person Identification and Forensic. In: Daimi, K., Francia III, G., Encinas, L.H. (eds) Breakthroughs in Digital Biometrics and Forensics. Springer, Cham. https://doi.org/10.1007/978-3-031-10706-1_7.
8. Nitish Gupta, "The Origins and Implications of Ambidexterity", International Journal of Innovative Science and Research Technology, Volume 9, Issue 7, pp. 2788-2792, July - 2024.
9. Tomasz DzieDzic, "Right hand wRiting vs. left hand wRiting of one peRson. a compaRative study", Problems of Forensic Sciences 2013, vol. 94, 564-577.
10. Al-Musa Alkahtani, Abdulaziz, "The influence of right or left handedness on the ability to simulate handwritten signatures and some elements of signatures: A study of Arabic writers", Science & Justice, 53, 2, pp. 159-165, 2013, <https://doi.org/10.1016/j.scijus.2012.02.001>.
11. Pottle N., Chavan S.H., Kekane Y.H., Tembhurne S.U., Pandey N. Variation in Genuine Handwriting While Writing on an Unusual Surface. J Forensic Sci Res. 2023; 7, pp. 25-33.
12. Mohit Mann, Shivani Patel, Vaishali Awasthi, Chaitanya Vats and Surbhi Mathur, "Determination of the hand of the writer based on Handwriting characteristics", Research Journal of Forensic Sciences, Vol. 8(2), 9-19, July (2020).
13. Ana Calvete. Conceptions of authenticity in contemporary travel writing: from Siberian

- nature to hyperreal America. Literature. Université Toulouse le Mirail - Toulouse II; Helsingin yliopisto (Finland), 2022. English. ffNNT: 2022TOU20110ff. fftel-04191779f.
14. Saad M. Darwish, Ashraf M. El-Nour, "Automated Offline Arabic Signature Verification System using Multiple Features Fusion for Forensic Applications", Arab Journal of Forensic Sciences & Forensic Medicine, e 2016; Volume 1 Issue (4), 424-437.
 15. Abu-Taieh, Evon, Auhood Alfaries, Nabeel Zanoon, Issam H. Al Hadid, and Alia M. Abu-Tayeh. 2018. 'A Deterministic Algorithm for Arabic Character Recognition Based on Letter Properties'. Artificial Intelligence - Emerging Trends and Applications. InTech. doi:10.5772/intechopen.76944.
 16. Al-Musa Alkahtani, Abdulaziz, "The influence of right or left handedness on the ability to simulate handwritten signatures and some elements of signatures: A study of Arabic writers", Science & Justice, Vol. 53, 2, pp. 159-165, 2013.
 17. Seeling, Patrick. Reisslein, Martin. Fitzek, Frank H.P. Li, Shu-Chen. Speidel, Stefanie. Strufe, Thorsten. Simsek, Meryem. Reisslein, Martin "Chapter 14, Traces for the Tactile Internet: Architecture, concepts, and evaluations", Tactile Internet. Academic Press, pp.321-349, 2021.
 18. Baraa K. Mohamed, Thamer A. Rehan, Mahmoud A. Hussein, Louay A.I. M. Ali, Homam A. Mohammed, Firas H. Abdulrazzak, Ayad F. Alkaim, Takialdin A. Himdan, "Review Part 1: Handwriting Analysis, Forgery and Counterfeiting", International Journal of Science, Engineering and Technology, 2025, 13:3, <https://www.researchgate.net/publication/393401524>