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Effects of Handedness on Fingerprint Quality and Performance

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Objective: To examine any differences in quality and performance of fingerprint images due to handedness

Introduction

- Individual characteristics like age, gender, and occupation have shown to have an impact on fingerprint quality and performance
- If a difference is found, the standard practice of using the right hand for fingerprint images would need to be changed to let the user present their dominant hand, creating a more user-centric system
- This study looked at the quality, false accept rate (FAR) and false reject rate (FRR) of fingerprints from multiple sensor technologies based on the handedness of the individual

Methodology

- 40 participants: 20 left-handed (13 male, 6 female, 1 no response) 20 right-handed (13 male, 7 female)
- Collected images from thermal swipe, optical touch, and capacitive touch sensors
- 6 images collected from index and middle finger of each hands
- Image quality scores and matching performance rates were calculated

Results

Table 1. Kruskal-Wallis p-value of NFIQ scores for handedness by finger ($\alpha = .05$)

	Right Index	Right Middle	Left Index	Left Middle
Thermal Swipe	0.058	0.805	0.057	0.220
Optical Touch	0.672	0.097	0.812	0.007
Capacitive Touch	0.004	0.819	0.055	0.759

Figure 1. NFIQ distributions by sensor

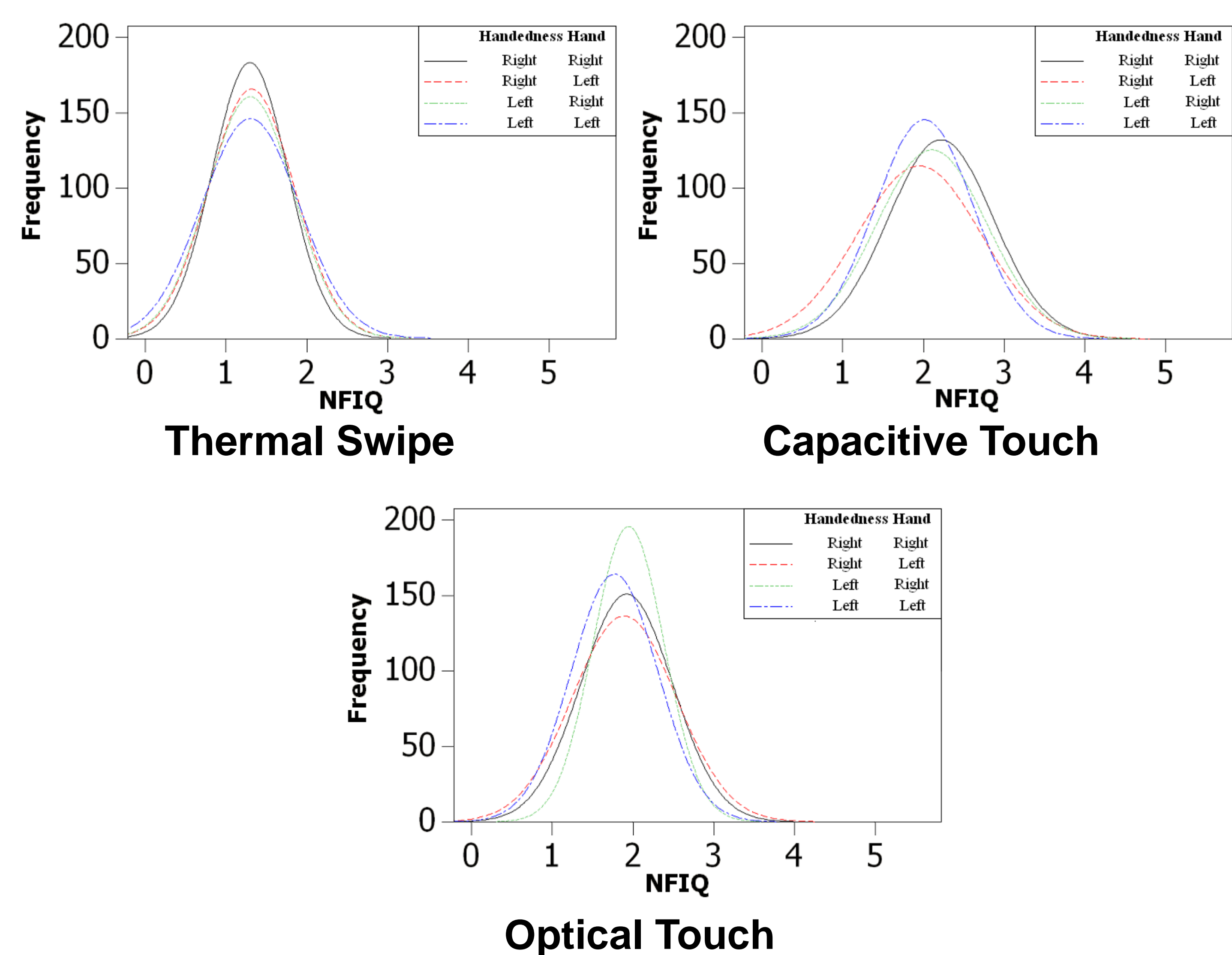


Table 2. Matching Errors by Finger and Sensor (FAR, FRR)

	Left Handed		Right Handed	
	Left Hand	Right Hand	Left Hand	Right Hand
Thermal Swipe	0.00%, 1.98%	0.00%, 0.00%	0.00%, 0.00%	0.00%, 0.00%
Optical Touch	0.00%, 0.00%	0.00%, 0.00%	0.059%, 0.00%	0.00%, 0.00%
Capacitive Touch	0.008%, 0.72%	0.044%, 1.667%	0.04%, 1.11%	0.0044%, 0.19%

Conclusions

- In the capacitive sensor, the dominant hand outperformed the non-dominant, while right-handed participants outperformed left-handed participants when comparing dominant and non-dominant hands
- The Kruskal-Wallis test showed that, based on handedness, the quality scores for the right index fingers are significantly different on the capacitive sensor, as are the left middle fingers when using the optical sensor. In both cases, the left-handed participants had better quality scores than the right-handed participants
- The NFIQ distributions were very similar when analyzed by sensor, with the exception of the right hand of left-handed participants, which is a much higher peak than the other groups