

Hand Dominance: Nature, Nurture, and Relevance for Hand Surgeons

Shan Shan Jing¹

¹Department of Hand Surgery, Royal Orthopaedic Hospital, Birmingham, United Kingdom

Address for correspondence Shan Shan Jing, MBBS, BSc, FRCS, Royal Orthopaedic Hospital, 30 Northiam London N12 HA, Birmingham, United Kingdom (e-mail: shanshanjing@gmail.com).

J Hand Microsurg 2022;14:111–112.

The preference of hand dominance is an important if not a unique human behavioral trait. Right-handers constitute the majority, while the left-handers comprise approximately 10 to 12% of the general population.¹ Some geographical variation exists possibly due to certain cultural and religious stigmatization against left-handers. Indeed, the word “right” in the English language means “correct” or “proper.” Archaeological evidence has shown that this polymorphism of handedness has remained ubiquitous for as long as 2 to 3 million years.² Therefore, evolutionary pressures must be present to maintain the diversity of handedness.

The question about nature or nurture is an interesting one. Although hand preference can be learnt, the genetic influence is surprisingly consistent. If two parents are right-handed, their offspring has a 10% chance of being left-handed.¹ However, if one or both parents are left-handed, the chance of their child being left-handed becomes higher at 18 to 22% and 27%, respectively. The maternal effects are stronger leading to the possibility that handedness is X linked.¹ Various genes including the leucine-rich repeat transmembrane neuronal 1 involved in neurodevelopment have also been implicated.¹ These innate disparities may account for the structural variances in the brains of the right- and left-handers, which allow them to process language, spatial relations, and emotions differently.²

However, genetic probability alone does not account for the asymmetry. Data suggest that the delicate balance in hand laterality may reflect an equilibrium between the competitive and cooperative effects on human evolution.² Based on the theory of negative frequency-dependent selection where the fitness of a behavior is inversely related to its frequency, left-handers may represent an important strategic advantage in battles.² This is seen in competitive sports such as baseball or cricket where being left-handed allows the players to deliver an unpredictable pattern of attack against their right-handed opponent.^{2,3} This explains why there is a higher proportion of left-handed athletes among international sports. However, this is offset by the cooperative pressure on our society.^{2,3} The human being is a tribal species. By sharing tool designed largely for our right-handed ancestors,

left-handers were placed at an operational disadvantage, susceptible to accidents, and became negatively selected against.² Left-handers have adapted to survive and with time drifted toward ambidexterity.

Although hand orientation can be perceived as early as gestation, it is most reliably detected in infancy from 6 months onward.⁴ Nevertheless, the initial development remains highly malleable. Through practice and refinement, an adult pattern of handedness emerges by the age of 10 to 12 years, but it does not stay static. Huge variations exist depending on the task-based requirements in terms of strength, speed, and precision. While right-handers frequently demonstrate consistency in their laterality, left-handers tend to display less functional asymmetry.⁴ Left-handers to use their dominant hand for force-required motions, while right-handers use their dominant hands for more accuracy-required motions. With age, hand preference attenuates as a result of physiological decline and injuries, and ambidextrous hand use becomes more prevalent.⁴

There is a popular perception that health disorders affect the dominant hand more frequently than the contralateral side, but this is not always the case. Lutsky et al found that common pathologies such as carpal tunnel syndrome, De Quervain’s tenosynovitis, osteoarthritis, and trigger finger affect both hands equally, except for lateral epicondylitis, which is more prevalent on the dominant side in men.⁵ With trauma, left-handers do suffer from more injuries including amputation than right-handers.⁶ The role of handedness and performance in recovery for these patients with significant alterations in their limb usage is less clear but has been explored in treatments such as mirror therapy. The effect of handedness on outcome assessments has also been debated. Some authors propose that the dominant hand is generally 10% stronger on dynamometers and fare worse in functional scores such as the Disabilities of the Arm, Shoulder, and Hand following injury when compared with the contralateral side. Others have disagreed.⁵

Numerous studies have also examined the influence of handedness in surgery. Left-handed surgeons have faced more challenges due to a lack of instrumentation and training.⁷

published online
June 22, 2020

© 2020. Society of Indian Hand & Microsurgeons. All rights reserved. Thieme Medical and Scientific Publishers Pvt. Ltd. A-12, 2nd Floor, Sector 2, Noida-201301 UP, India

DOI <https://doi.org/10.1055/s-0040-1713557>
ISSN 0974-3227.

Yet, a disproportionate number of left-handers in plastic and orthopedic surgery has been reported.^{7,8} It is postulated that these disciplines attract the higher degree of creative thinking that left-handers are thought to possess.^{1,2} In practice, left-handed surgeons have exhibited superior bimanual dexterity. This is not only valuable but also safe given the constraints of the operative field. Indeed, fewer complications have occurred from surgeries that were performed on the favored side of a right-handed surgeon in a variety of specialties.⁷ Therefore, it is good practice to train the non-dominant hand regardless of the surgeon's laterality. Simple modifications to our daily routines, such as using the non-dominant hand for brushing teeth, can be effectively translated onto the operating table.⁷

Hand preference remains a subject of speculation. Although inheritable, it interchanges throughout our lifespan through experience, learning, and practice. Understanding its origin and impact will enable us to make better informed choices in the management of our patients and to find opportunities to enhance our surgical performance.

Funding

None.

Conflict of Interest

None declared.

References

- 1 Llaurens V, Raymond M, Faurie C. Why are some people left-handed? An evolutionary perspective. *Philos Trans R Soc Lond B Biol Sci* 2009;364(1519):881–894
- 2 Corballis MC. The genetics and evolution of handedness. *Psychol Rev* 1997;104(4):714–727
- 3 Billiard S, Faurie C, Raymond M. Maintenance of handedness polymorphism in humans: a frequency-dependent selection model. *J Theor Biol* 2005;235(1):85–93
- 4 Scharoun SM, Bryden PJ. Hand preference, performance abilities, and hand selection in children. *Front Psychol* 2014;5:82
- 5 Lutsky K, Kim N, Medina J, Maltenfort M, Beredjiklian PK. Hand dominance and common hand conditions. *Orthopedics* 2016;39(3):e444–e448
- 6 Taras JS, Behrman MJ, Degnan GG. Left-hand dominance and hand trauma. *J Hand Surg Am* 1995;20(6):1043–1046
- 7 Lui DF, Baker JF, Nfila G, Perera A, Stephens M. Hand dominance in orthopaedic surgeons. *Acta Orthop Belg* 2012;78(4):531–537
- 8 Shay T, Kaufman T, Cohen AA, Ad-El D. Is being left handed an advantage toward a plastic surgery residency? *Plast Reconstr Surg Glob Open* 2020;8(1):e2589