

Handedness Effect on Bilateral Transfer

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Introduction

- Also known as cross transfer, the concept of bilateral transfer in motor learning describes the ability of the individual to transfer learned skills of one limb to the contralateral limb.
- Bilateral transfer has been a source of experimental study in motor learning since the early 1900s.
- Motor learning experiments most often are designed to determine a dominant source of transfer from one side of the body to the other in areas of time and force.
- Most studies conclude that bilateral transfer is most successful in the transfer from a non-dominant hand to dominant hand in the area of speed.
- Differences between left and right-handed individuals in the interhemispheric transmission of visuomotor information may exist and require further study.

Objectives

- Determine the effect of subjective handedness on the amount of bilateral transfer.
- Provide a basis of hemiplegic stroke patient outcome and progression timeframe based on patient handedness.
- Indicate the ability to transfer fine tune or gross motor patterns in sports performance between right and left handed players.

Methods

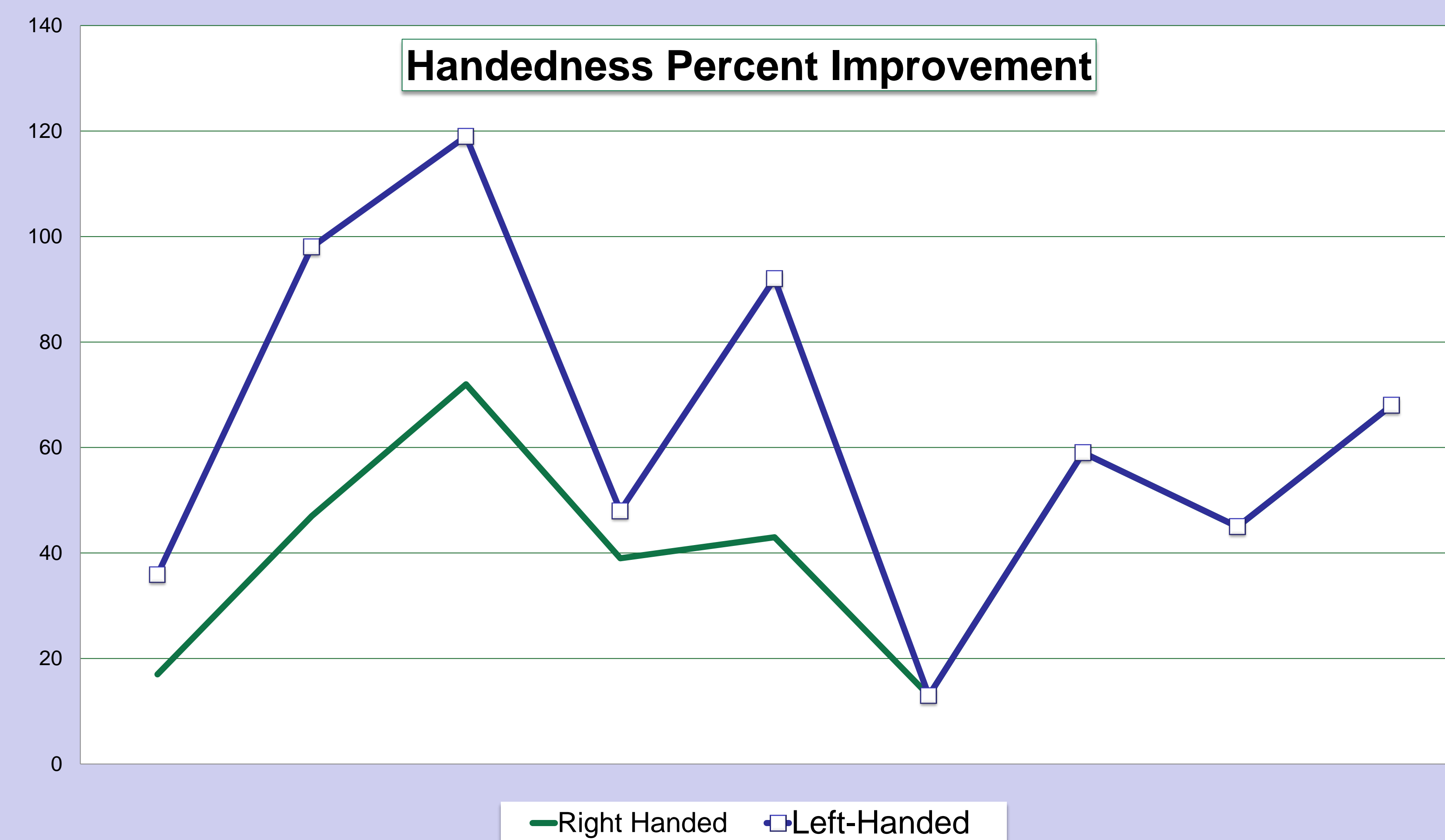
- Participants voluntarily agreed to schedule a one-time test after an email recruitment letter.
- After a concise study introduction, participants completed the informed consent and completed a subjective handedness survey.
- With a blinder blocking the view of the active hand, participants used a pencil to trace a star-shaped pattern using a handheld mirror reflection as fast and accurately as possible.
- Errors were counted each time the participant traced outside of the lines of the star pattern. A stopwatch began second count at a “go” signal from the researcher, and stopped when the participant completed the tracing pattern.
- The pattern for tracing was as follows: 1 time with non-dominant hand, 7 times for dominant hand, 1 time for non-dominant hand with 30 second breaks in between.



Results

Participants

- A total of 14 college age students were enrolled in this study, 50% (N=7) were female, and 35% (N=5) were left handed.
- Significant differences were found in the pre to post test scores in both the number of errors (p=0.0001) and time to complete the task (p=0.005).
- When stratified by dominant hand (left or right), only time to complete task was significantly different (p=0.04); whereas, the number of errors was not significantly different (p=0.09).




HANDEDNESS QUESTIONNAIRE

We would like you to answer a few questions about your handedness and that of your family, by ringing the best answer, or by ticking in the box. If you are not certain then please leave a item blank, rather than guess.

	Always right	Usually right	Either	Usually left	Always left
1. Which hand would you use:					
2. To hold a pen while writing a letter?					
3. To throw a ball at a target?					
4. To hold a pencil while drawing a picture?					
5. To hold a dish while drying it?					
6. To turn the wheels on a clock?					
7. To hold a jar while unscrewing its lid?					
8. To hold a thread while gassing it through the eye of a needle?					
9. To hold a leaf when eating with a knife and fork?					
10. As the top of a broom when sweeping the floor?					
11. To pick up a glass of water?					
12. Which foot would you use to kick a ball at a goal?					
13. With which eye would you look through a keyhole?					

14. Which of the following diagrams most closely corresponds to the position of your hand when writing?



15. Has injury, damage or disease ever meant you were unable to use your normally dominant hand? No / Yes

If Yes: How old were you? _____ years. Which hand was injured or damaged? Right / Left

Was the effect temporary or permanent? Temporary / Permanent If Temporary, how long? _____

Please describe the problem briefly: _____

16. Has any person ever tried to change your handedness? No / Yes

If Yes: Was it? From using the right hand to using the left hand / From using the left hand to using the right hand.

How old were you when the attempt was made? _____ years

Who was the person who tried to change your handedness? _____

How successful was the attempt? Very successful / Moderately / Not very / Not at all successful

Please tell us about the handedness of your family. Only describe annual (that is, blood) relatives, not step-parents, or persons adopted or fostered. If you are not certain about someone's handedness, do not guess, but say "Not sure".

17. Is (or was) your mother right- or left-handed? Right-handed / Left-handed / Not sure.

18. Is (or was) your father right- or left-handed? Right-handed / Left-handed / Not sure.

19. Is (or was) your mother's mother right- or left-handed? Right-handed / Left-handed / Not sure.

20. Is (or was) your mother's father right- or left-handed? Right-handed / Left-handed / Not sure.

21. Is (or was) your father's mother right- or left-handed? Right-handed / Left-handed / Not sure.

22. Is (or was) your father's father right- or left-handed? Right-handed / Left-handed / Not sure.

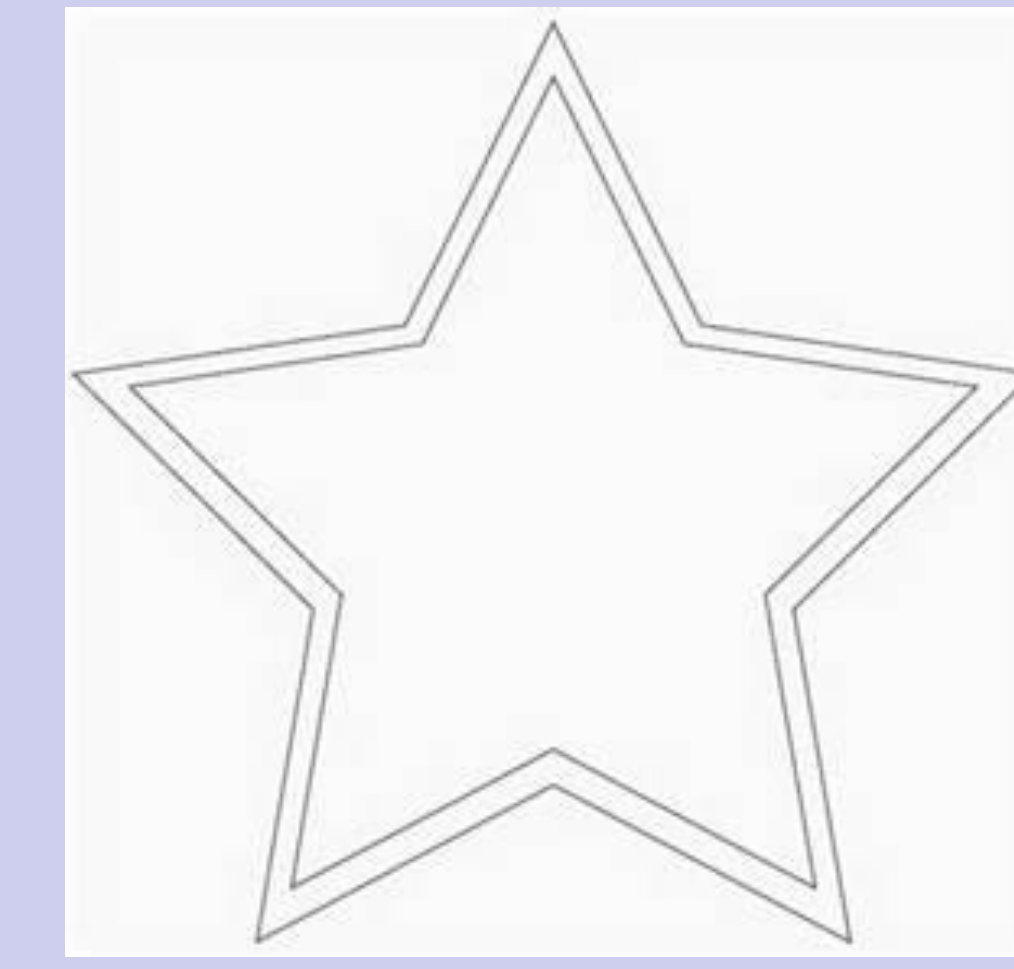
23. How many sisters do you have? _____ How many are right-handed? _____ How many are left-handed? _____

24. How many brothers do you have? _____ How many are right-handed? _____ How many are left-handed? _____

25. How old are you? _____ years

26. Are you male or female? Male / Female

THANK YOU FOR YOUR HELP WITH THIS RESEARCH PROJECT



The star pattern used as the motor skill of mirror tracing is displayed above.

Data Analysis

Data analysis included a T-Test and percent improvement comparison. The following formula was used for percent improvement:

$$(post-test T - pre-test T) / pre-test T$$

Discussion

- The effect of hand dominance in regards to timing of the task is significant to the acquisition of fine motor movements.
- Subjective determination of handedness is effective in the determining bilateral transfer speed.
- Limitations of this study include a relatively small sample size of left-handed participants.
- Future research should focus on the effect of bilateral transfer motor tasks on the contralateral limb muscle activity to establish interhemispheric activation theory.

Conclusions

This study suggests that there may be significant skill transfer from the dominant to non-dominant hand. It does appear that perfection of a task (number of errors) is as easily transferred, regardless of which hand is dominant.

The results may have implications for athletics whose participation in sports requiring perfection of movement is important and stroke patients where transfer of activities from affected to non affected side is important.

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