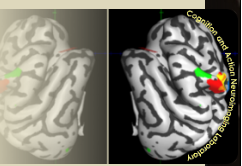




# VISUAL AND MOTOR EXPERIENCES OF HANDWRITING CONTRIBUTE TO GAINS IN VISUAL RECOGNITION

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## BACKGROUND

### Handwriting experience influences letter perception

Handwriting increases letter recognition in preliterate children. <sup>1,2</sup>

Handwriting increases novel symbol recognition in literate adults. <sup>3</sup>

### Dynamic representations affect visual recognition

Experience observing how an object moves is part of how dynamic representations are created. <sup>4,5,6</sup>

Handwritten letters contain movement cues that aid an observer in letter recognition <sup>7</sup>, particularly when the cues are congruent with the observer's writing style. <sup>8,9</sup>

Dynamic information about stroke order can aid letter recognition in impaired readers, but only when drawn in a typical stroke order. <sup>10</sup>

### Research Questions:

1. Is **dynamic information** encountered during handwriting influential in symbol recognition?
2. Is **visual-motor experience** with the symbol necessary or might visual experience alone be sufficient?

**Hypothesis:** **Dynamic information** encountered during handwriting is influential in recognition and the **visual-motor** experience of handwriting contributes to the formation of these dynamic representations.

## METHODS

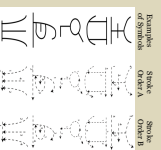
### PARTICIPANTS

204 literate, right-handed adults; sample size chosen based on power analysis

### STIMULI

48 novel symbols with experimentally determined stroke orders and directions

Each symbol had *two possible stroke orders*

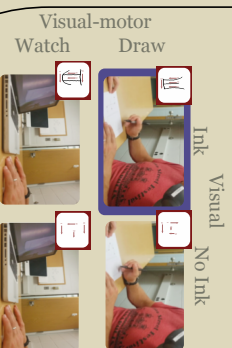


## METHODS

### TRAINING

Each symbol trained through one condition in only *one stroke order* 6 times each

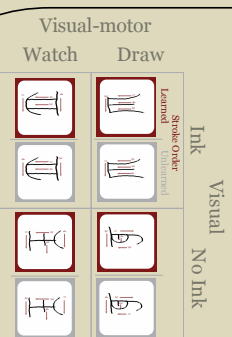
Videos for the Watch conditions were recorded during a yoked participant's Draw conditions



### TESTING

Participants presented with symbols on which they had trained (targets) and novel symbols (distractors) in learned and unlearned stroke orders

Forced choice: Did you learn this symbol? (disregarding stroke order)

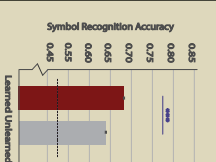


## RESULTS

A 2 (Visual-motor: draw, watch) x 2 (Visual: ink, no ink) x 2 (Stroke Order: learned, unlearned) Repeated-measures ANOVA revealed 3 main effects, a 2-way interaction between Visual and Stroke Order, and a 3-way interaction.

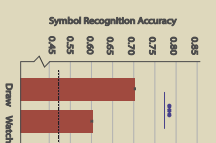
### Stroke Order

**Main Effect:** Dynamic information from production results in more accurate recognition when watching someone else produce.



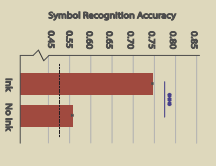
### Visual-motor

**Main Effect:** Self-production results in more accurate recognition than watching someone else produce.



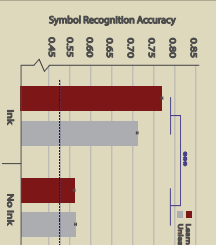
### Visual

**Main Effect:** Responses were more accurate when the symbols were presented with ink than without ink.



### Visual x Stroke Order Interaction:

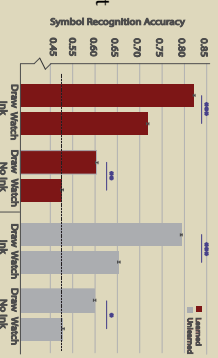
Responses were more accurate when the symbols were presented with ink than without ink when the symbols were presented with the learned stroke order when training included visual experience.



## RESULTS

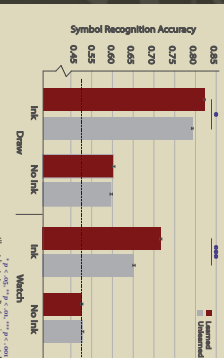
### Visual-motor experience aids symbol recognition.

Drawing with ink and without ink resulted in more accurate recognition for symbols presented in learned and unlearned stroke orders.



### Visual-motor and visual-only experiences with symbols form dynamic representations.

Drawing and watching with ink resulted in more accurate recognition for symbols presented in learned compared to unlearned stroke orders.



There were no differences between learned and unlearned stroke orders for symbols learned in the no ink conditions.

## DISCUSSION

Visual-motor experience with symbols (i.e., handwriting) resulted in the greatest gains in symbol recognition.

One way that handwriting increases symbol recognition is through the formation of **dynamic representations** for the learned symbols.

The influence of **dynamic representations** in symbol recognition is largely related to the **visual experience** of seeing the symbol unaided.

## REFERENCES

1. Oakfield, J.A., & Bink, L.A. (1997). Visual perception of dynamic information in the production of handwriting. *Journal of Experimental Psychology: Applied*, 3, 1-10.
2. Oakfield, J.A., & Bink, L.A. (1997). Visual perception of dynamic information in the production of handwriting. *Journal of Experimental Psychology: Applied*, 3, 1-10.
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8. Oakfield, J.A., & Bink, L.A. (1997). Visual perception of dynamic information in the production of handwriting. *Journal of Experimental Psychology: Applied*, 3, 1-10.
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