

Mental Processing Speed and Learning: Implicit and Explicit Learning of Spatial Location Sequences

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Objective

The goal of this project was to investigate a potential relationship between Mental Processing Speed, or how quickly an individual processes visual information, and learning. Since mental speed is considered to be a basic cognitive process that influences higher order cognition, such as reasoning, it is important to understand its relationship to learning. In particular we are interested in two types of learning: Implicit and Explicit.

IMPLICIT AND EXPLICIT LEARNING

Learning can be defined as the process of acquiring new information, which can be facts, behaviors, or as in this experiment, a visual pattern of sequential target locations. Implicit Learning is when this process occurs without the learner having conscious awareness while Explicit Learning involves some inclusion conscious awareness and attention.

Learning (Serial Reaction Time) task: This task measures the reaction time of a participant pressing keys corresponding to the location of the stimuli on the screen. This was done twice. In the implicit version participants were unaware of a pattern, while they were forewarned in the explicit condition.

MENTAL PROCESSING SPEED

Inspection time task: This task measures the minimum amount of time needed for making accurate decisions about a target stimulus

-The duration the target is presented was varied by block 80, 50, 30, 20, 10ms (15 trials per block)

In this study we used 3 inspection time tasks

- Speeded Detection:** Did you see the letter?
- Speeded Identification:** What was the letter?
- Speeded Discrimination:** Do the letters in the pair match?

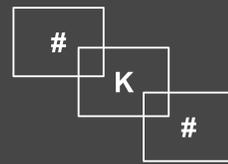
Hypotheses

- 1) Some individuals will be able to correctly identify the sequential target pattern on the learning task.
- 2) Reaction times across the blocks of the learning task will indicate learning, as evidenced by quicker responses from random trials to sequential and from initial sequential to the final block of sequential trials.
- 3) Main Hypothesis: Individuals who are able to correctly identify the pattern on either learning task will show faster information processing on the speed measure.

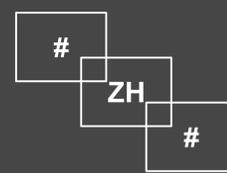
Mental Speed (Inspection Time) Tasks

- Speed Task 1: Letter Detection & Identification**
- Speed Task 2: Letter Discrimination**

Task 1

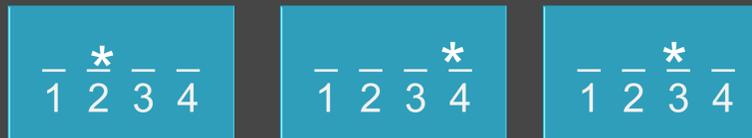


Task 2



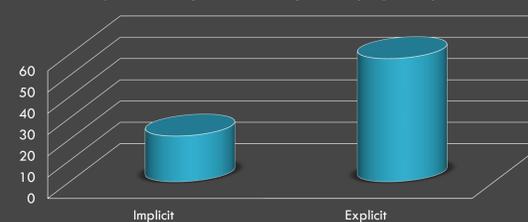
Learning (Serial Reaction Time) Task

A star appeared at one of four locations and the participant pressed the key corresponding to the location. After the participant has made the response the star will appear in a new location 350 ms later and the participant must press the key corresponding to the new location.

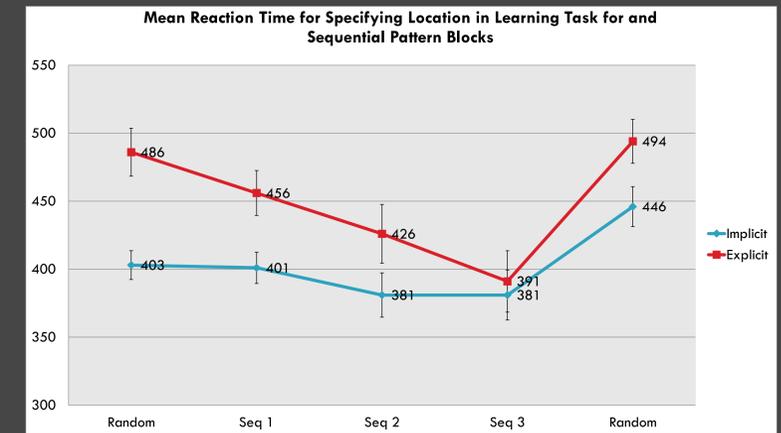


The two ways learning was assessed included an awareness assessment where the participants were asked to identify the pattern after each portion of the task was completed (In the implicit condition participants were first asked if they saw a pattern) as well as taking the difference scores between trial blocks.

Percentage of Participants Correctly Identifying the Spatial Pattern

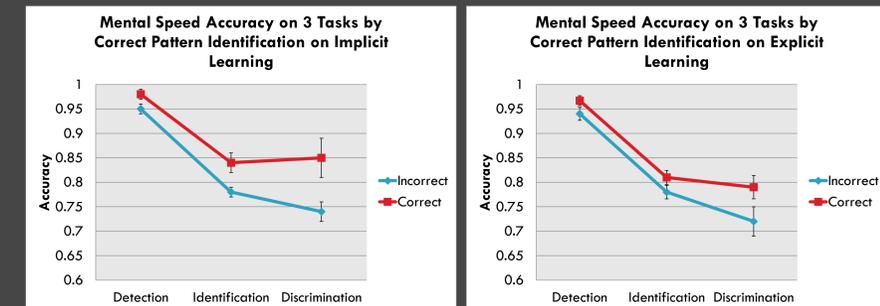


Evidence for Learning through Reaction Time



These data indicate that participants show signs of learning on both conditions since reaction times decrease as they reach the final sequential block. Also that implicit reaction times were generally faster than times for the explicit condition, perhaps because participants are taking longer to consciously analyze the pattern since they are informed a priori that it does exist in this condition.

Individual Differences Findings



The findings from the above graphs indicate that those who could identify a pattern on the implicit version of the task performed better on all 3 mental speed tasks, whereas being able to identify the correct pattern on the explicit version is only associated with one type of speed: discrimination.

Discussion

Findings of this exploratory cognitive research provide more insight into the nature of basic processes that are associated with learning. Results support the hypothesis that there is a relationship between an individual's ability to learn and how quickly that person processes visual input. Findings are also consistent with the notion that fast information processing may allow information to reach conscious awareness more readily and perhaps aid in the identification of a pattern of events.

Acknowledgements

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References

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