Effects of Instructional Variations on Implicit Sequence Learning

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Abstract

This experiment was designed to investigate how implicit sequence learning varies when participants have different beliefs about the presence and nature of the pattern embedded in an alternating serial reaction time task. Participants performed two sessions, the first of which was under one of four conditions. One group was not informed of the presence of the pattern. The other three groups were given different levels of information about the pattern. One was told only the basic structure of the pattern and was asked to try to identify it more specifically. The other two groups were asked to memorize an exact pattern and to search for it during the task. While this pattern was accurate for half of the subjects, it was inaccurate for the others. During the second session, all subjects were told that the stimuli would be random. All four groups showed significant learning on implicit measures. Only one subject successfully located his pattern explicitly during testing, however. For the remaining subjects, we found that all four groups showed the same amount of learning. This suggests that beliefs about the nature of the pattern, even false ones, do not affect implicit learning.

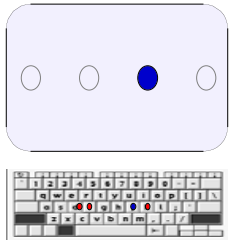
Introduction

Explicit knowledge provided in the form of a context can facilitate retention of information. Furthermore, context is important not only for recall but also for processing of incoming information (Bransford and Johnson, 1972). What is less clear is how explicit knowledge affects implicit learning.

Willingham et al. (1999) suggested that in motor skill learning explicit knowledge can guide motor behavior while implicit learning is gained in parallel. In motor sequence learning, Curran & Keele (1993) found that subjects benefited from explicit knowledge of the sequence on the SRT task. Thus, there is evidence that explicit knowledge can be useful in producing skilled behavior.

In the experiment reported here, we sought to test whether performance on an implicit sequence learning task varies when participants are given different levels of explicit knowledge about the presence and nature of the pattern during Phase I of the task. In order to test whether any group differences in learning observed are the result of task demands or of implicit learning, we also had a Phase II where explicit knowledge was eliminated.

The Alternating SRT Task



- Four spatially arranged stimuli
- Subjects press corresponding keys
- Stimuli follow predetermined pattern
- Pattern and random trials alternate
- Pattern four positions long
  - Sample pattern: **1-r-2-r-3-r-4-r**

Experimental Design

Task:
-Alternating SRT task
Subjects:
24 GU students, ages 18-24.
Procedure:
- 4 conditions, 6 subjects in each.
- 2 phases in the experiment (twenty-one 90-trial blocks in each).
  - Phase I: 4 conditions
  - Phase II: All subjects treated the same: told no pattern present.

Measure of Implicit Learning:
Trial Type Effect: A difference in performance between pattern and random trials.

Conditions: Phase I

Incidental *Not informed* about the presence of the pattern.	*Intentional-General* Told about *existence* and nature of the pattern and asked to try to find it.
Intentional-Accurate Given their *exact* pattern and asked to try to find it.	*Intentional-Inaccurate* Given an *inaccurate* pattern and asked to try to find it.

Results

Phase I:

- Everybody showed learning on at least one of the measures by the end of Phase I.
- Response Time Measure: There was no significant effect of instructional condition.
- Accuracy Measure: There was a significant effect of instructions.
  -Intentional Inaccurate and Incidental groups performed better than other two groups.

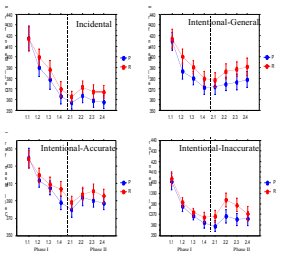
Phase II:

- There were no group differences on either measure.

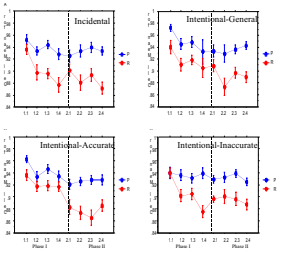
Explicit knowledge differences

Incidental No one guessed the pattern with high confidence.	*Intentional-General* One person guessed the correct pattern on over half the blocks.
Intentional-Accurate All subjects were able to recall the pattern we told them.	*Intentional-Inaccurate* All subjects were able to recall the pattern we told them.

Median Response Time Graphs -- 5-block sets on x-axis



Accuracy Graphs -- 5-block sets on x-axis



Conclusion

- **Implicit learning of subtle regularities can occur relatively independently of explicit knowledge.**

Evidence

- During Phase I each group showed learning, including the one given false information about the pattern.
- There were small group differences in implicit learning during Phase I, but these disappeared during Phase II, suggesting that the effect of explicit knowledge on Phase I was on performance rather than implicit learning.