

Implicit Learning in Kindergarten Children

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Abstract

To extent to which young children learn without conscious awareness, called implicit learning, has far-reaching implications for psychology and education. However, available research on this topic with young children is generally contradictory or task-specific. This study aims to explore the implicit learning capabilities in kindergarten children with a cued-reaction time task. Results show that reaction time decreased as children learned the cue-target relationship, and increased when the cue-target was disrupted, demonstrating implicit learning. Most children indicated no awareness of the cue-target relationship.

Introduction

Views of how children learn are undergoing drastic revision. Whereas traditional accounts of learning have emphasized the importance of feedback and error-correction processes (e.g. hypothesis-testing and reinforcement learning), recent innovations in learning theory including statistical, computational, and Bayesian approaches argue that there is a great deal of structural information contained within the environment (i.e. temporal or sequential) that may be extracted with simple learning algorithms. One such form of learning that appears to be ubiquitous in adults' learning is implicit learning (IL), which may be described as learning without conscious awareness.

IL is thought to be an evolutionarily primitive system mediated by subcortical structures rather than the frontal cortex; therefore it should be insensitive to differences due to age or intellect, making it observable in even young children and under a variety of task conditions. Evidence of IL in young children, however, is often contradictory and specific to the type of IL task. Beyond establishing that IL is possible in children, there is a need for greater understanding of the processes, extent, and limitations of IL in children.

The purpose of the present experiment is to explore whether attention or stimulus demands place limitations upon the implicit learning capabilities in kindergarten children in a cued-reaction time (CRT) task (Burke & Roodenrys, 2000; Tomiczek & Burke, 2008). This task allows experimenters to assess whether participants have implicitly acquired a relationship between a cue and target in a rapidly presented sequence of stimuli. If children learn the cue-target relationship, they will exhibit faster reaction times during cued trials compared to non-cued trials. Also, follow-up probe questions allow unambiguous determination that children are unaware of the nature of the learned cue-target relationship. In order to test whether stimulus factors affect IL, we vary the discriminability of stimuli to be learned.

Methods

Participants: The sample contained 45 typically developing kindergarten children (5-6 years old).

Procedure: When shown a series of rapidly presented stimuli (e.g., letters, Japanese characters, or geometric shapes) on a computer screen, children pressed the space bar as quickly as possible whenever they saw the target (e.g., R).

The first phase consisted of three cued presentation blocks (each containing 6 trials) in which a cue (e.g., V) reliably preceded the target (e.g., R). Within each trial, the sequential order of 9 stimuli was randomly varied with the exception that the cue-target relationship was maintained.

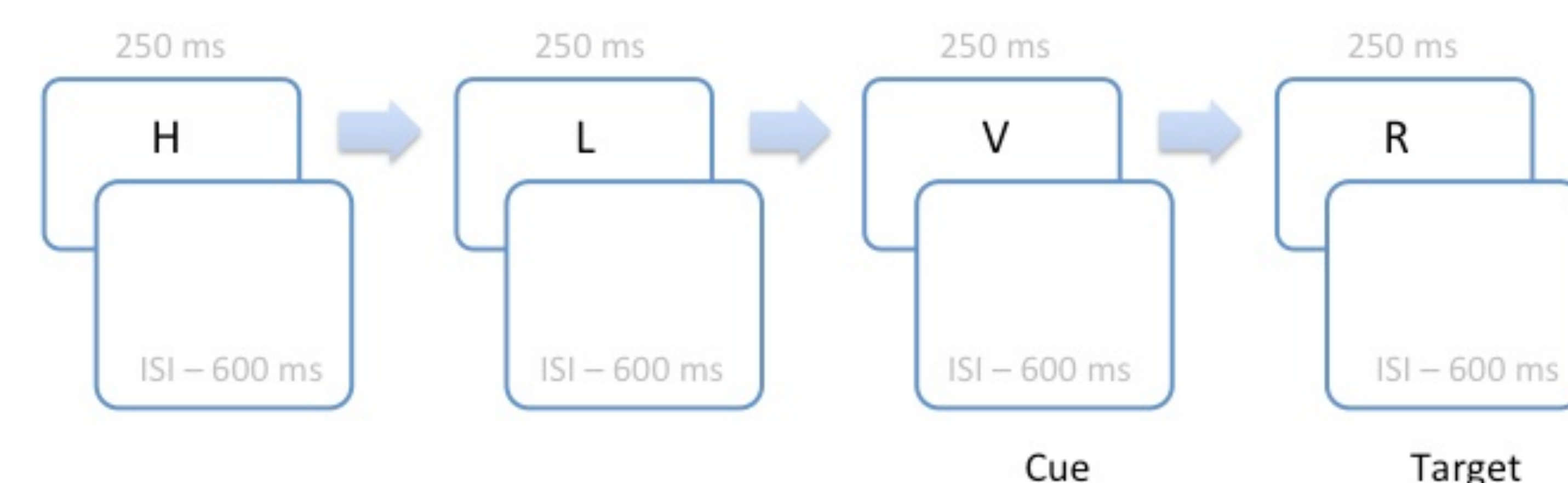
The second phase consisted of two non-cued presentation blocks (each containing 6 trials) in which the cue (e.g., V) was sequentially separated from the the target (e.g., R).

The final phase consisted of two cued presentation blocks.

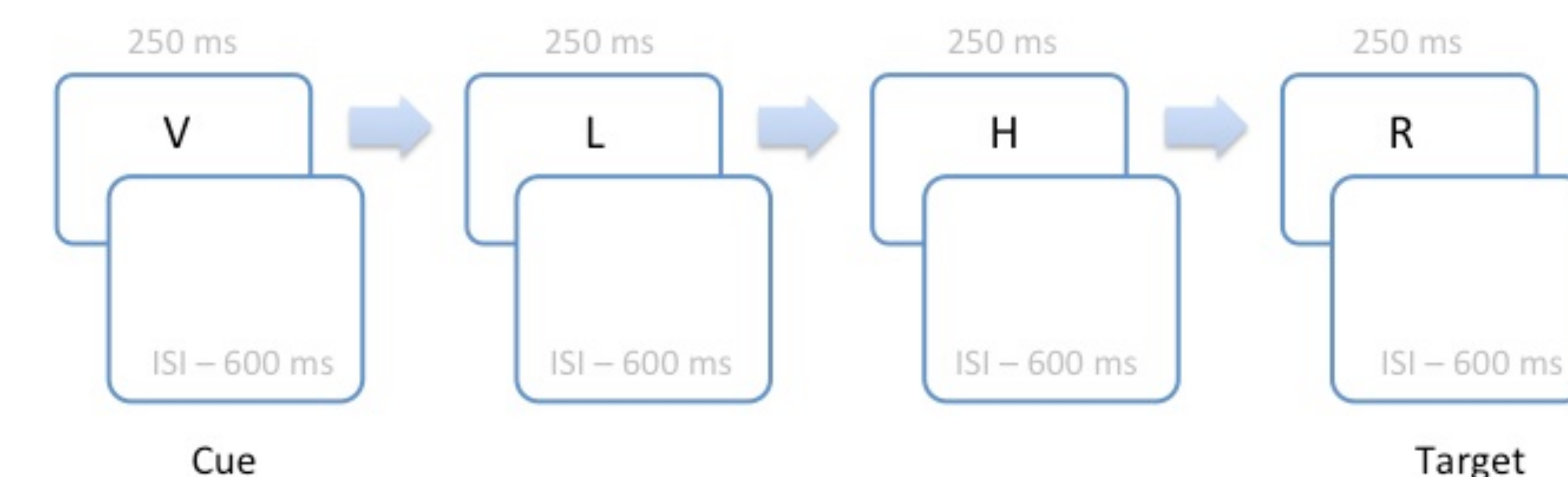
As a between-subjects factor, children were exposed to either letters, Japanese characters, or geometric shapes.

After testing, children answered probe questions to determine their awareness of the cue-target relationship.

Cued Presentation



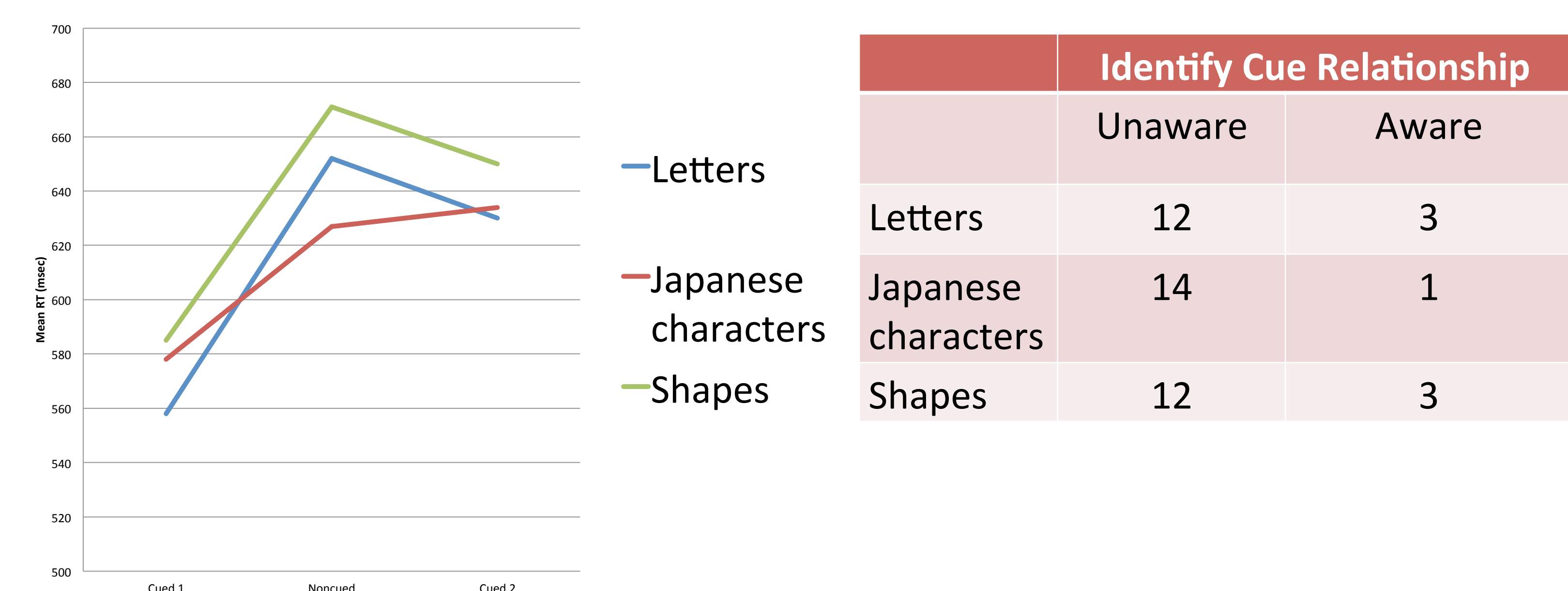
Non-cued Presentation



Results

After RTs were averaged across blocks into phases, group results showed a significant main effect as RT decreased as children learned the cue-target relationship, increased when the cue-target relationship was disrupted, and decreased again when the cue-target relationship was reestablished. The majority of children were unaware of the cue relationship.

Upon closer examination of the individual stimuli, only children who were exposed to the letters and shapes showed a significant increase in RT when the cue-target relationship was disrupted. None of the stimulus groups showed a significant decrease in RT as the cue-target relationship was re-established.



Conclusions

These findings provide evidence that the CRT task is able to tap implicit learning processes in kindergarten-aged children. Further, children's IL in the CRT task shows important similarities to results from adults, demonstrating developmental continuity. The present results also indicate there are limits to IL in children due to stimulus discriminability.

References

- Burke, D., & Roodenrys, S. (2000). Implicit learning in a simple cued reaction-time task. *Learning and Motivation, 31*, 364-380.
- Tomiczek, C., & Burke, D. (2008). Is implicit learning perceptually inflexible? New evidence using a simple cued reaction-time task. *Learning and Motivation, 39*, 95-113.

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