Overnight Consolidation and Retention of Implicit and Explicit Knowledge of Incidentally Learned Auditory Categories
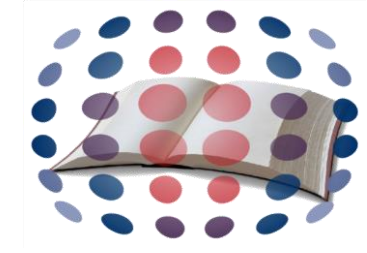
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مركز إدموند ج. سفرا لبحوث الدماغ في العسر التعليمي

INTRODUCTION

- The mechanisms by which phonetic categories are acquired are poorly understood.

- Examining acquisition of **nonspeech auditory categories** illuminates the learning mechanisms available to phonetic category learning.

- Most previous work has examine learning across **explicit tasks** in which listeners are aware of categories, make explicit decisions, and receive a corrective feedback [e.g., 2-3]).

- However, category learning – including phonetic category learning – often occurs under conditions in which listeners are **actively engaged** in environments in which categories are associated with **rich, multimodal cues** and **behaviorally-relevant outcomes**. [e.g., 3-4]

THE 'SMART' TASK

- Our prior research established the The **S**ystematic **M**ultimodal **A**ssociation **R**eaction **T**ime (SMART) paradigm to investigate this *incidental auditory category learning*. [4]

The SMART Task

A simple visual detection task. Indicate the location of the 'X' as quickly and as accurately as possible.

Five sounds precede the visual target. Unknown to participants these sounds are drawn from one of four categories, each associated with a particular target location.

Sound categories predict the upcoming location of the visual target.

APPROACH

Training Blocks involve a consistent category-location relationship.

Test Blocks break this relationship.

Reaction Time Cost ($RT_{test} - RT_{train}$) is a covert measure of category learning.

Explicit Labeling Task (which box will the X appear?, with no X) is an overt measure of category learning.

Two Training Types
- Constant exemplar
- Variable exemplar

CONSTANT- same exemplars were presented

VARIABLE – different exemplars were presented

RESULTS

COVERT MEASURE: RT Cost

Day 1: ONLINE LEARNING
Significant only for the VARIABLE condition

Day 2: CONSOLIDATION
Evidence of learning for CONSTANT only after consolidation period.

Day 10: RETENTION
Learning retained for VARIABLE and CONSTANT at Day 10.

OVERT MEASURE: Explicit Labeling

Day 10: RETENTION

EXPLICIT POSTTEST CATEGORIZATION
Significant for multidimensional and unidimensional categories.
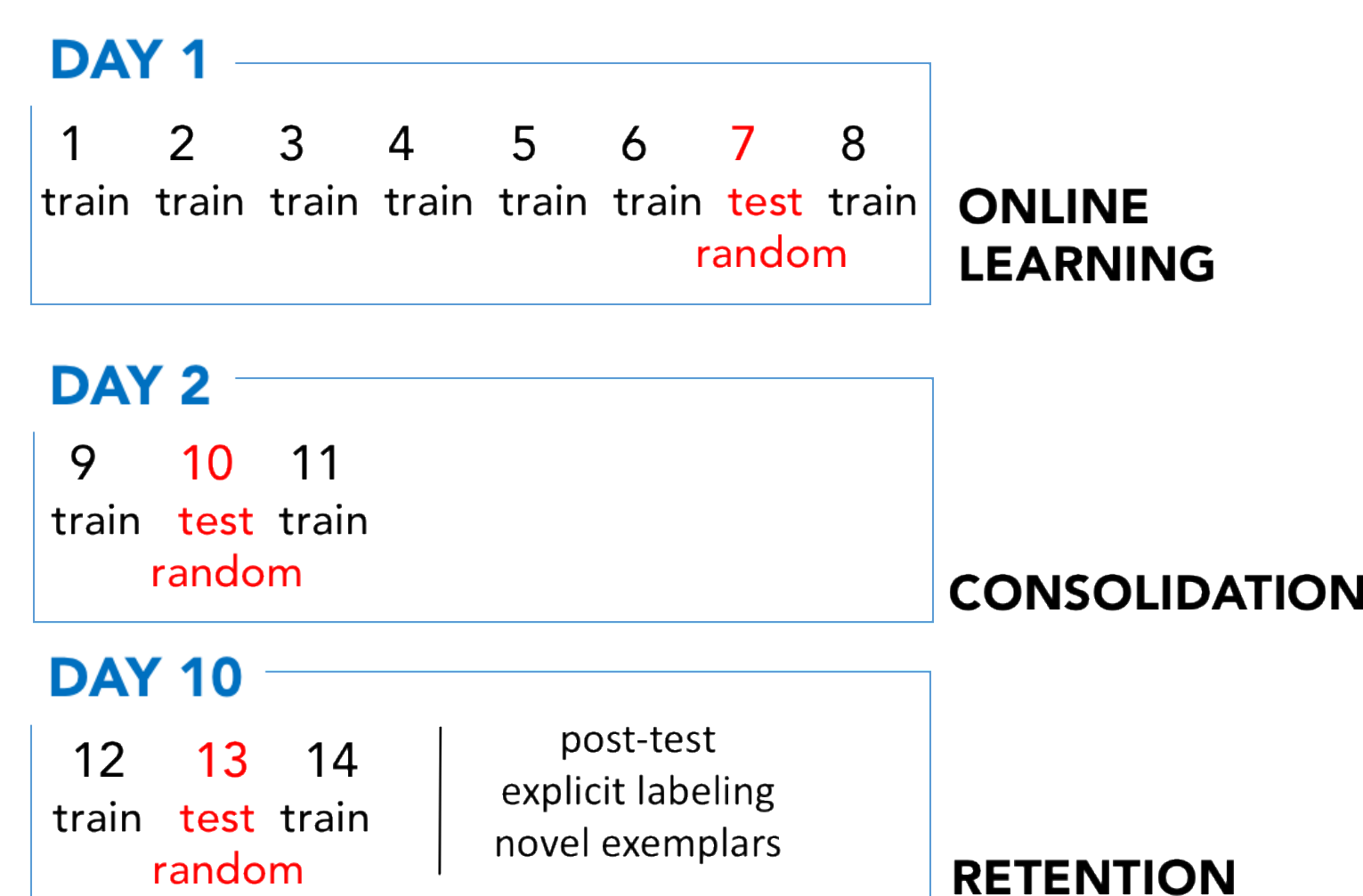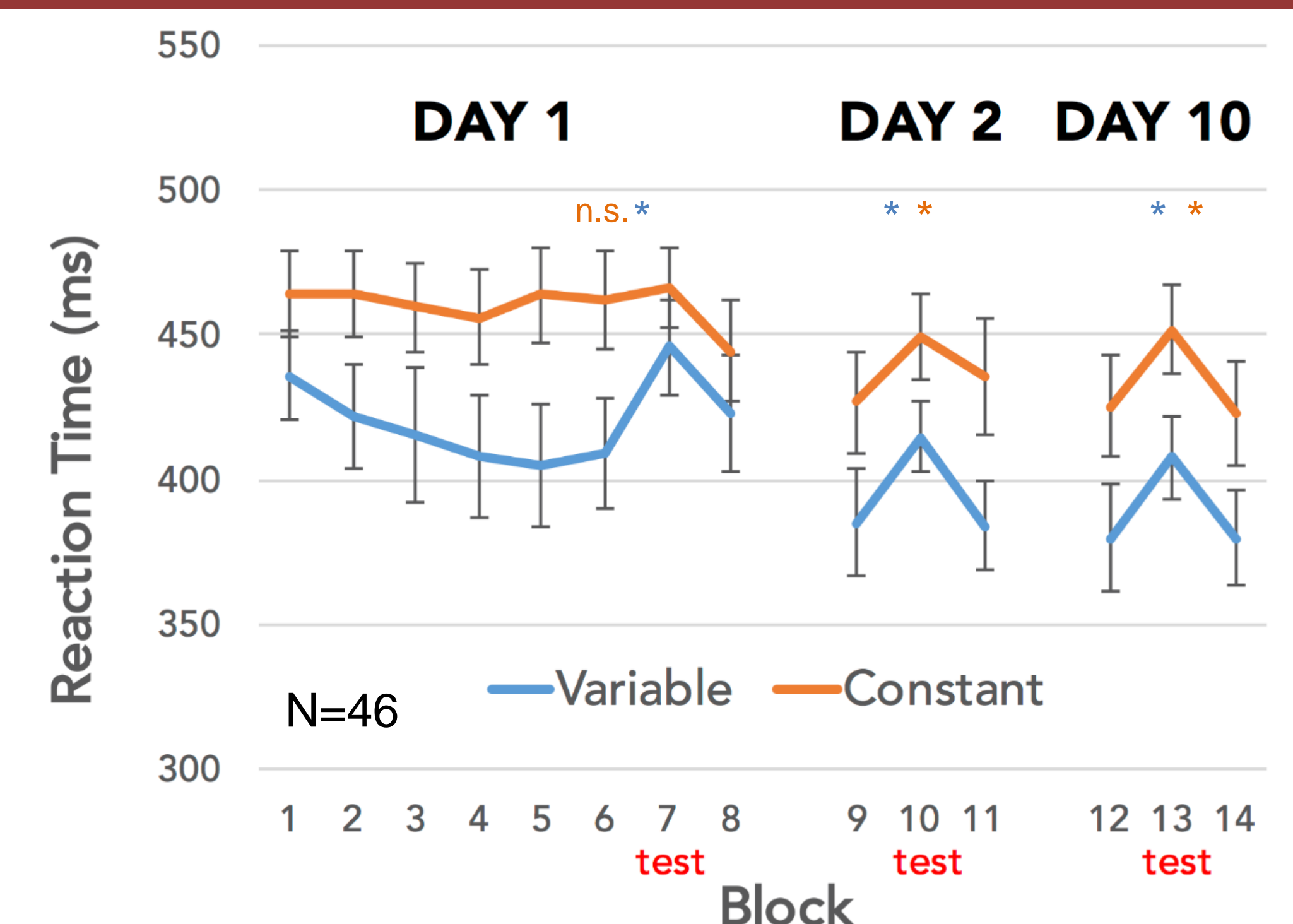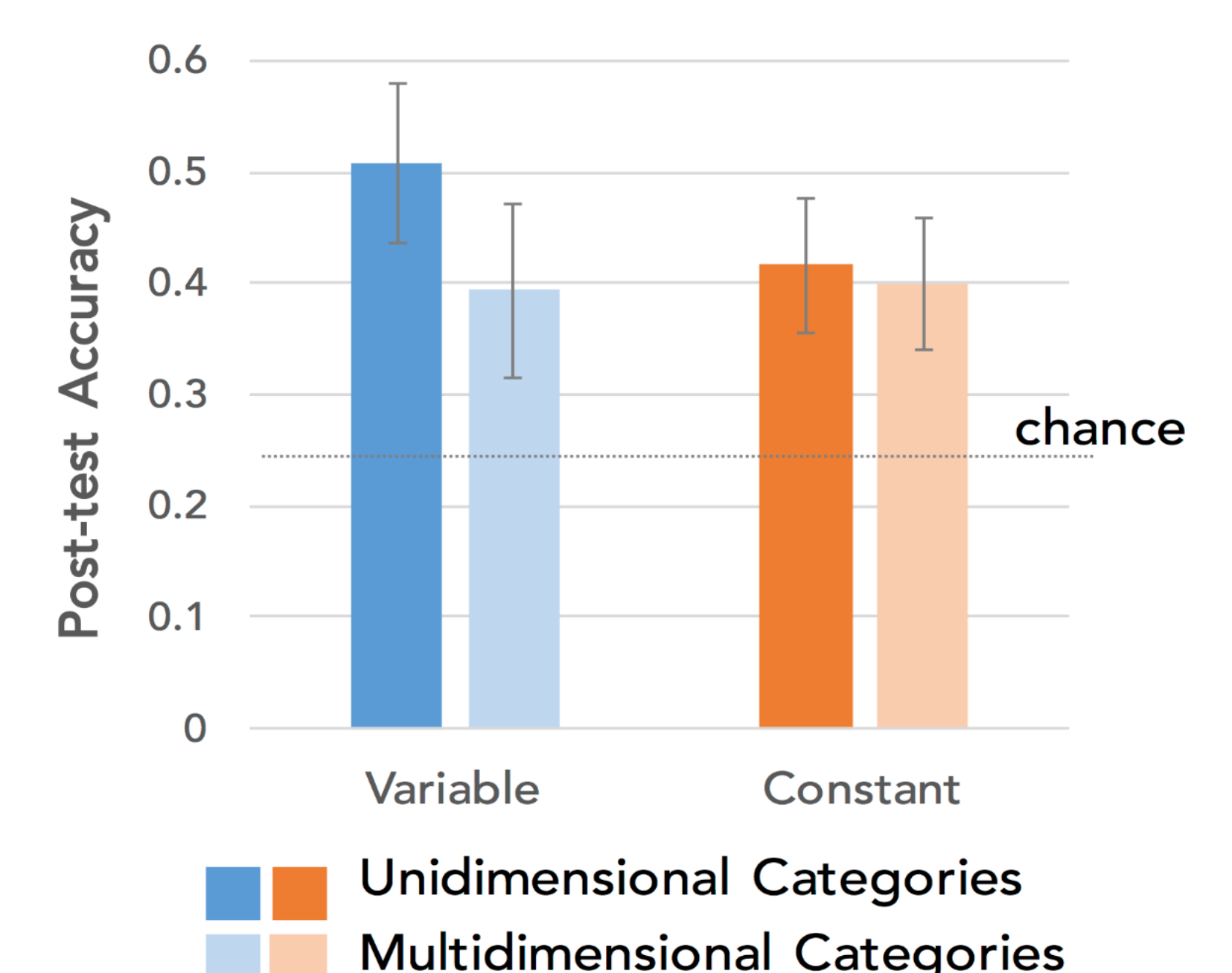

RESEARCH AIM

- Here, we examine the relationship between category learning within a session (online, fast learning) in relation to **consolidation** (offline, slow learning) and **retention** of incidental auditory category learning.

- We do so in the context of manipulating variability of category exemplars in training because prior work [4] demonstrated more robust learning with within-trial variability.

CONCLUSIONS

- Offline' processes resulting in performance gains can be triggered for incidental auditory experience associated with, but not necessary for, a visuomotor task.

- Experiencing variable exemplars tied to task-driven behavior can enhance incidental auditory category learning.

- Learning may be present even if not behaviorally stable in online session (offline gains for CONSTANT condition)

- Incidentally learned auditory categories are robust across modest retention intervals.

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