# Performance on a statistical learning task predicts syntactic adaptation

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## Introduction

- *Adaptation* occurs when language users dynamically update their behavior or expectations based on changes in the linguistic environment.

- *Statistical learning* is argued to be a very general mechanism by which learners track and use distributional information to acquire linguistic structure.

- *Does statistical learning underlie both acquisition and later adaptation?* If so, performance on an independent measure of statistical learning should correlate with ability to rapidly adapt native language expectations.

## Syntactic Adaptation Task

- Measures ability **to rapidly adapt expectations** about syntactic structure

- *Task:* self-paced reading task (based on Fine, et al. 2013)

- *Critical stimuli:* temporarily ambiguous sentences, main verb vs. relative clause

> 1) The experienced soldiers warned about the dangers **before** the midnight raid.
> 2) The experienced soldiers warned about the dangers **conducted** the midnight raid.

[10 ambiguous MV,10 ambiguous RC, 10 unambiguous MV, 10 unambiguous RC, +75 fillers]

- *Prediction:* individual variation in ability to adapt expectation *from main verb* (more common in everyday experience) *to relative clause*

## Statistical Learning Task

- Measures ability **to track distributional information** to learn about dependencies

- *Task:* SRT non-adjacent dependency learning (based on Gomez 2002, Misyak et al., 2010)

- *Stimuli:*
  - Sequences of *aXb*
  - *a__b* drawn from set of three pairs
  - *X* drawn from set of 24 intervening elements

| TOOD | BALIP | DAK |
|---|---|---|
| RUD | GENSIM | PEL |

A sample array for the trial *rud balip pel*. Participants hear words one at a time, must click on matching cell each column.

[35 minute exposure period followed by forced-choice grammaticality judgment task]

- **Prediction:** individual variation in ability to learn non-adjacent dependency

## Method

Participants: 30 adults recruited via Amazon Mechanical Turk

Participants completed four separate HITs on AMT on separate days ($$ bonus for completing)

*Primary Tasks*:
- Statistical learning task
- Syntactic adaptation task

*Additional Tasks*:
- Cognitive control (Stroop task)
- Print exposure (author recognition task)
- Verbal working memory (reading span task)

## Results: individual tasks

**Statistical learning:**
- Score on grammaticality judgment task
- M=6.4, SD=2.7

**Syntactic adaptation**:
- (Ambiguous RC – Unambiguous RC) at disambiguating region
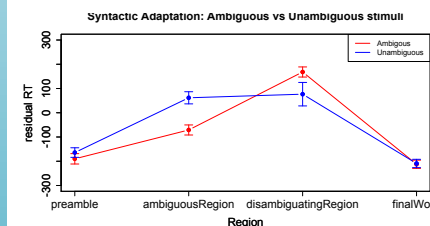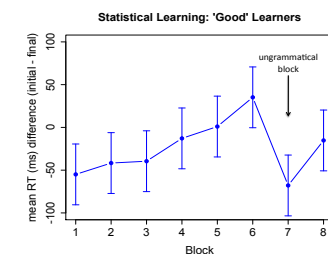- (First block – Last block)
- M=79.2, SD=313.4

## Results: correlation

✓ **Syntactic adaptation correlates with statistical learning** (r=0.41, p=0.025)

- **In regression model:**
  ✓ **Statistical learning score predicts syntactic adaptation score** (p=0.09)
  ✓ No other tasks are significant predictors
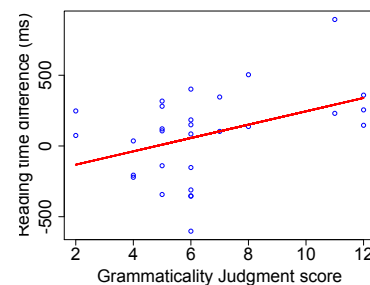
## Conclusions

- *Statistical learning ability is correlated with syntactic adaption ability* (other potentially confounding individual differences are not).

- Suggests that the *same mechanism* that underlies learning from distributional cues during acquisition can be *used to dynamically impact the linguistic system at any age*

## Selected References

Fine, A. B., Jaeger, T. F., Farmer, T. A., & Qian, T. (2013). Rapid Expectation Adaptation during Syntactic Comprehension. *PLoS ONE*, 8(10), e77661. doi:10.1371/journal.pone.0077661

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